इंडोशन्यूज़
INDOSHNEWS

कार्यस्थल पर सुरक्षा, स्वास्थ्य और पर्यावरण पर अर्द्धवार्षिक समाचार-पत्र
HALF YEARLY NEWSLETTER ON SAFETY, HEALTH AND ENVIRONMENT AT WORKPLACE

PUBLISHED BY

कारखाना सलाह सेवा एवं श्रम संस्थान महानिदेशालय
Directorate General Factory Advice Service & Labour Institutes
श्रम एवं रोज़गार मंत्रालय, भारत सरकार
Ministry of Labour & Employment, Government of India
सायन, मुंबई 400 022, महाराष्ट्र, भारत
Sion, Mumbai 400 022, Maharashtra, India

Website: www.dgfasli.gov.in

Vol. 4 No. 1 & 2 **JANUARY - DECEMBER 2023**

INDOSHNEWS

Vol. 4 No. 1 & 2 January - December 2023

Published by

Directorate General Factory Advice Service
& Labour Institutes
Ministry of Labour & Employment
Govt. of India
N S Mankikar Marg, Sion
Mumbai - 400 022, Maharashtra, INDIA

Visit us at: www.dgfasli.gov.in

The electronic version of the INDOSHNEWS on Safety, Health and Environment at workplace can be accessed at www.dgfasli.gov.in

MESSAGE

As we embark on a new year filled with promise and challenges, it gives me immense pleasure to welcome you to the latest edition of our half yearly newsletter, INDOSHNEWS on Safety, Health, and Environment at Workplace.

In today's fast-paced world, where the dynamics of work environments are constantly evolving, ensuring the safety, health, and well-being of our workforce remains paramount. It is our collective responsibility to foster an environment where every individual feels valued, respected, and protected. Over the past year, despite various hurdles presented by global events, we have made significant strides in advancing our commitment to workplace safety, health, and environmental sustainability. Through diligent research, proactive measures, and collaborative efforts, we have continued to enhance our understanding of emerging risks and implement effective strategies to mitigate them. In line with the concept of "Atmanirbhar Bharat", we emphasize self-reliance in Occupational Safety and Health (OSH), advocating for indigenous solutions, capacity building, and knowledge transfer to empower organizations and individuals to address safety challenges effectively.

The salient features of the current issue encapsulate a comprehensive exploration of key aspects crucial to ensuring workplace safety, health and environmental sustainability. Firstly, we introduce the ground-breaking "DGFASLI Safety Card" a tangible and practical tool designed to instill safety consciousness and fostering a culture of safety in the workplace. Furthermore, the issue delves into the enduring commitment of DGFASLI to prevent major accidents and enhance industrial safety standards. A statistical analysis spanning a decade of Occupational Safety & Health (OSH) data offers invaluable insights into long-term trends, emerging challenges and areas for improvement, serving as a cornerstone for evidence-based decision-making and policy formulation. This comprehensive overview of OSH data collected from registered factories over the past nine years, shedding light on prevalent workplace hazards and accident rates, while also highlighting areas of success and opportunities for enhancement. Additionally, a detailed trend analysis focusing on accidents, both fatal and non-fatal, reported by DISH Telangana during the first half of 2023, provides a localized perspective for stakeholders to identify the patterns, prioritise interventions and allocation of resources effectively. Finally, a compelling case study on the styrene gas leak incident in Visakhapatnam offers a critical examination of the root causes, response mechanisms and lessons learned, underscoring the importance of robust risk management practices and emergency preparedness in averting catastrophic events. These salient features collectively serve to empower stakeholders with actionable insights, practical guidance and inspiring narratives, driving forward the collective endeavor towards creating safer, healthier, and more sustainable workplaces.

In closing, let us reaffirm our commitment to upholding the highest standards of safety, health and environmental stewardship in all our endeavors. Together, we can create workplaces that not only prioritise productivity but also the well-being of our most valuable asset i.e. our people.

Baidya Nath Jha

(B. N. Jha)
Editor-in-Chief
Deputy Director General, DGFASLI

Place: Mumbai

CONTENTS

Efforts made by DGFASLI to Prevent Major Accidents after Bhopal Disaster

Abstract

At present there are more than 2200 Major Accident Hazards (MAH) factories across the nation and new industries are also establishing at a rapid rate. Chemical accidents occurs due to lack of safety measure, technical break down, or due to a human error thereby initiates a series of uncontrolled physiochemical phenomenon such as runaway chemical reactions, large spills, fires and explosions. The role of DGFASLI in respect of Major Accidents is primarily preventive in nature.

1. Introduction

India is developing as a key global player in the industrial and technology sector. Rapid industrialization has increased the hazard, risk and vulnerability to the industry and the environment. Major Chemical disasters are low in frequency but are very significant in the terms of loss of lives, injuries, environmental impact and property damage. At present there are more than 2200 Major Accident Hazards (MAH) factories and new industries are also establishing at a rapid rate. Chemical accident occurs due to lack of safety measure, technical break down, or due to a human error thereby initiates a series of uncontrolled physiochemical phenomenon such as runaway chemical reactions, large spills, fires and explosions. These phenomenon eventually targets both human and non-human in the form of immediate and residual or long term consequences. Thus, it is imperative to develop preventive measures like adoption of safer engineering practices, improved safety devices and elimination of human errors by regular checks.

The Directorate General Factory Advice Service and Labour Institutes (DGFASLI) a technical arm of Ministry of Labour & Employment, Government of India, advises the Government on the matters concerning occupational safety and health in industries and 12 Major Ports of the country. DGFASLI is also enforcing the safety & health related statutes in the 12 major ports. The role of DGFASLI in respect of Disaster Control is primarily preventive in the sense that it advises the Government for statutory changes to improve the safety and health conditions in the factories and also carry out promotional activities viz. training, education, capacity building, research, documentation, policy advocacy, knowledge management and networking on issues related to risk reduction and management of Major Accident Hazards through its Central Labour Institute, Mumbai and Regional Labour Institutes at Chennai, Faridabad, Kanpur and Kolkata.

2. Role of DGFASLI in Implementation of ILO Project on Controlling Major Accident Hazards in India

The Ministry of Labour & Employment implemented ILO project on 'Establishment and initial operation Major Accident Hazards Control System in India' for controlling major accident hazards first in 12 selected states. The Directorate General Factory Advice Service and Labour Institutes (DGFASLI), a department subordinate to the Ministry of Labour, conducted this work from December 1986 to December 1990 in the manufacturing sector (i.e., factories) and later extended the project to the port sector, where work was conducted from January 1991 to April 1993. The Central Labour Institute (CLI), Mumbai, the three Regional Labour Institutes (in Kolkata, Chennai and Kanpur) and the Inspectorates of Dock Safety and the Inspectorates of Factories of the 12 states participated in implementing the project. The immediate objective of the project was to strengthen the national system for preventing occupational accidents in certain industrial activities through identification, analysis and control of industrial activities involving hazardous chemicals and processes which have the potential to cause major accidents.

3. Role of DGFASLI in Establishing Three-Tier Technical Organisation on Major *Accident Hazards Control*

A three-tier technical organisation, incorporating the national, regional and state levels, was set up to control major accident hazards. At the national level, a multidisciplinary advisory division to control major accident hazards, staffed with relevant specialists, was set up in the Central Labour Institute, Mumbai. At the

regional level, cells to control major accident hazards were set up in the three Regional Labour Institutes, i.e., in Chennai, Kanpur and Kolkata. Similarly, at the state level, specialist cells were set up in the headquarters of the Inspectorates of Factories. The advisory division at CLI Mumbai and the cells at three RLIs function as the resource centres for the control of major accident hazards. Among other work, they provide technical advice and guidance on hazardous chemicals to industry; they investigate major accidents; they develop technical guidelines and training material, and conduct specialized training programmes on the control of major accident hazards and chemical safety to different target groups; and they conduct studies and safety audits of hazardous operations. The system for controlling major accident hazards in India, as established under the ILO project, consists of the following elements:

4. Computerized Data Bank

Computerized data banks having appropriate databases on the control of major accident hazards were established in the Central and the three Regional Labour Institutes. These data banks enable the storage, retrieval and dissemination of information. The databases include the inventories of the hazardous chemicals; the major accident hazard works/sites and the specialists in the field of major accident hazards control; the Chemical Information System (CIS) database on occupational safety and health; the incidents involving major accident risk; the details of the specialized training programmes conducted for the control of major accident hazards within the enforcement authorities and industry. The advisory division for the control of major accident hazards and its cells has prepared technical guidelines on various aspects of hazard control such as checklists for the Inspectors to use when performing inspections of bulk storages of ammonia, chlorine, and liquefied petroleum gas (LPG). Similarly, guidelines on the provision of medical care in emergencies involving the ten most common hazardous chemicals were prepared in English and Hindi, and distributed to the management at major accident hazard sites.

5. Strengthening of the Labour Institutes and Inspectorates of Dock Safety

The Central Labour Institute, three Regional Labour Institutes and the Inspectorates of Dock Safety have been strengthened in the field of chemical safety and the control of major accident hazards by recruiting/deploying officers with qualifications and experience in chemical engineering. The technical competence of these officers and other specialists was developed by providing them with appropriate training in the control of major accident hazards in India and/or abroad. This has enabled the Labour Institutes and the Inspectorates of Dock Safety to develop technical guidelines and training materials, to carry out joint inspections with Inspectors of Factories, to perform studies and safety audits of hazardous operations, to conduct training programmes for the Inspectors of Factories, Inspectors of Dock Safety, and technical personnel from the industry, and to provide technical advice to the major accident hazard factories.

6. Strengthening of the Inspectorates of Factories

The Inspectorates of Factories of the states having a considerable number of major accident hazard factories were strengthened in the field of chemical safety by recruiting Inspectors with chemical engineering qualifications. All the Inspectors were trained in the control of major accident hazards abroad and/or in India. In addition, the Inspectors were given specialized in-service training in inspecting major accident hazard sites, and criteria were developed for prioritizing the major accident hazard sites. Development of the technical competence of the Inspectors and equipping the Inspectorates with the necessary instruments has thus enhanced their preconditions to execute their tasks.

7. Strategies for Training & Capacity Building

Keeping in mind the greater emphasis laid in on training, a three-fold training strategy was developed. The three focal points are to identify the target groups, to develop appropriate training material, and to conduct training programmes. The following target groups which need specialized training in the control of major accident hazards were identified: Inspectors from the Inspectorates of Factories and Dock Safety; senior executives; safety officers; workers who are members of safety committees; supervisory trainers from the major accident hazard works, port authorities; and trade union leaders at both the national and regional levels. Training manuals were developed to provide the background reading material needed by these training programme participants. There are now manuals on techniques of inspecting chemical plants and on the control of major accident hazards that are meant for the senior Inspectors of Factories, as well as manuals on the control of major

accident hazards that are meant for safety officers, supervisory trainers and workers who are members of safety committees. Since then, a large number of specialized training programmes and seminars have been held for the participants from the various target groups. A notable feature is the input of several ILO experts in various aspects of the control of major accident hazards in these seminars and training programmes. The training material developed by the Central and Regional Labour Institutes is highly significant, as it helps other institutions and bodies to organize training programmes on the control of major accident hazards, which is essential as there are many more people to be trained.

8. Statutory Framework Towards Prevention Of Major Accidents and Role of DGFASLI Thereof

I. The Factories (Amendment) Act 1987:

Ministry of Labour & Employment, with the assistance of DGFASLI, in the meanwhile, reviewed the existing statute dealing with safety and health of workers employed in factories. The extensive consultations were also held among the stake holders and it was agreed to amend the Factories Act 1948 by bringing in a concept of hazardous process industries into the Factories Act and inclusion of the provisions for prevention, control & mitigation of impact in an additional chapter IV-A in the Factories Act. The Government of India has enacted the Occupational Safety, Health and Working Conditions (OSH&WC) Code, 2020, which has received President's assent on 28th September, 2020. The OSH&WC Code, 2020 subsumes the Factories Act, 1948 along with 12 other labour laws, which proposes to regulate the Occupational Safety, Health and Working Conditions of the persons employed in establishments as defined under the Code for preventing accidents in factories involving hazardous process.

II. Rules for the Control of Major Accident Hazards :

The Draft regulations on the Control of Industrial Major Accident Hazards (CIMAH) were first prepared as model rules and later on notified by the states under the Factories Act of 1948. Through extensive consultations between the Ministry of Labour and the Ministry of Environment, Forests and Climate Change these regulations were later harmonized with the draft rules prepared by the Ministry of Environment and Forests. The Ministry of Environment, Forests and Climate Change included the rules, as the Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 under the Environment (Protection) Act 1986. These rules to control major industrial accident hazards aim at preventing major accidents in certain industrial activities. Authorities concerned have been entrusted with the responsibility of enforcing the provisions into their respective fields. For example, the Chief Inspectors of Factories were assigned the duty of enforcing the relevant provisions of the rules in factories and the Chief Inspector of Dock Safety in ports. Major Accident Hazards Control Rules have been framed by DGFASLI at par with MSIHC Rules and have been notified for States for implementation under the Factories Act, 1948.

9. Ongoing Efforts by DGFASLI

9.1 Prevention of Major Accidents in Major Ports

DGFASLI is enforcing MSIHC Rules 1989 in the 12 Major Ports of the country ensuring prevention of Major Accidents through its inspecting officers in Docks to carry out:

- Inspection of MAH installations and Submission of inspections report to the Chief Inspector of Dock Safety (CID) DGFASLI.
- Submission of annual inspection report.
- Issuance of Improvement notices.
- Notification of MAH installations after receipt of the applications.
- Inspection, investigation and analysis of major accidents.
- Scrutiny of the mock drill reports.
- Periodical review of onsite emergency plans of MAH installations as per the requirements.
- Preparation of guidelines for inspection of MAH installations in ports and checklists for inspection of specific installations. In addition to the MSIHC Rules, implementation of the provisions on harmful environments and handling of dangerous goods as per Dock Safety Act and Regulations.

9.2 Prevention of Major Accidents in Factories

The Major Accident Hazards Control Advisory Division and Cells, functioning in Central and Regional Labour Institutes respectively are

carrying out following promotional activities towards prevention of Major accidents and mitigation thereof:

a. Providing Consultancy services on Hazard identification & Risk Assessment, HAZOP, PHA, Safety Audit, Risk and Consequence analysis of potential major accidents.

b. Material Safety Data Sheet (MSDS) Central Labour Institute (CLI) of DGFASLI has collected and dissemination data bank of various chemicals and its MSDS. CLI supplies MSDS to manufacturers of these chemicals on their request.

c. DGFASLI has introduced a three months course for the doctors who are engaged in the examination of hazardous process factory workers. The full time regular course of three months duration is conducted with the objective to identify and manage the occupational health disorders / occupational diseases encountered in various industries in the country and to manage the industrial accidental incident caused by chemical intoxication, in general and in hazardous process industry in particular.

d. The curriculum of the course has designed to meet the requirement of Section 41 C(c) of Factories Act, 1948 and Model Factory Rules made there under and Section 85 (c) of Occupational Safety, Health and Working Conditions Code, 2020.

e. One Month Certificate Course for the supervisors engaged in the hazardous process industries In order to meet the requirement of Section 41C(b) of Factories, Act,1948 for the competent supervisors in hazardous process industries DGFASLI conducts through Central and Regional Labour Institutes One month certificate course for the supervisory personals to be employed in hazardous process industries as prescribed under first Schedule of Factories, Act,1948.

f. Conducting specialized Training programmes, workshops for potentially hazardous Chemical industries (Major Accident Hazard Installations) in the key areas viz. Onsite Emergency Planning, Offsite Emergency Planning, Management of Hazardous Chemicals, Major Accident Hazards Control, Chemical Process Safety for different target groups such as Safety Professionals, Factory Inspectors, Workers representatives of Safety Committee and management personnel etc.

g. DGFASLI is conducting one year Safety Diploma course through its Central and Regional Labour Institutes as mandatory qualification for Safety Officer under Section 40B of the Factories Act 1948. Syllabus of Safety Diploma Course has been revised emphasizing safety in chemical industries.

10. Conclusion

DGFASLI is playing an vital role in preventing chemical accidents like Bhopal disaster in factories as well as Ports by improving safety and health conditions and carrying out promotional activities viz. training, education, capacity building, research, documentation, policy advocacy, knowledge management and networking on issues related to risk reduction and management of Major Accident Hazards.

References:

A. *https://dgfasli.gov.in*
B. *DGFASLI INDOSHNEWS*
C. *DGFASLI Standard Reference Note 2020*
D. *ILO project report "Establishment and Initial Operation of Major Accident Hazards Control System in India"*
E. *ILO Major Hazard Control Practical Manual Geneva 1993*
F. *https://dmibhopal.mp.gov.in*
G. *https://moef.gov.in*
H. *Websites of various state CIF/DISH*
https://ndma.gov.in

Occupational Safety & Health (OSH) in India: A Statistical Analysis of 10 Years of OSH Data

Abstract

This article aims to present a comprehensive analysis of Occupational Safety & Health (OSH) data in India over the past decade (2012-2021), pertaining to factories registered under the Factories Act, 1948. The article aims to identify trends, disparities, and areas for improvement in worker well-being by analyzing data on registered factories, employment, fatalities, non-fatal injuries, and dangerous occurrences. Utilizing statistical analysis, visualizations, and comparative assessments, the article sheds light on the current state of OSH in India. The key findings include fluctuations in registered factories and employment, trends in dangerous occurrences, and a consistent decline in fatal and non-fatal injuries. The analysis reveals the need for continuous improvement in workplace safety and proactive measures to address emerging challenges.

1. Introduction:

The International Labour Organization (ILO) defines Occupational Safety and Health (OSH) as a multidisciplinary field concerned with the well-being and safety of workers in the workplace[1]. The primary goal of OSH is to ensure that working environments are safe and do not pose any harm to the physical, mental, or social well-being of workers.

The Ministry of Labour & Employment, Government of India's 'National Policy on Safety, Health and Environment at Work Place' recognizes that safety and health of workers has a positive impact on productivity and economic and social development[2].

In order to create and maintain a safe and healthy working environment and comply with the OSH requirements pursuant to national laws and regulations, employers are encouraged to make appropriate arrangements for the establishment of an OSH management system[3].

By analyzing 10 years of OSH data across Indian States/UTs, this article aims to provide an analysis and examine trends in key indicators such as the number of factories, workers, fatalities, non-fatal injuries, and dangerous occurrences.

2. Methodology:

The article uses secondary data collected from the office of the Chief Inspector of Factories (CIF) / Directorate of Industrial Safety & Health (DISH) of all States/UTs of India having factories registered under the Factories Act, 1948 as per the Ministry of Labour's (State Level) mechanism of collecting OSH Data[4].

The data, covering the period from 2012 to 2021, is organized by State/UT and year. This structured arrangement of data allows for an in-depth analysis of trends and discrepancies, offering valuable insights into the observed patterns and variations over the specified temporal span.

The data over the period 2012-2021 covers:

- Registered Factories
- Employment in Factories (Workers)
- Dangerous Occurrences
- Fatal Injuries
- Non-Fatal Injuries

The data on the above for the period 2012-2021 is analysed and the detailed findings is discussed as below:

[1] https://www.ilo.org/wcmsp5/groups/public/---europe/---ro-geneva/---sro-budapest/documents/publication/wcms_797477.pdf

[2]https://labour.gov.in/sites/default/files/SafetyHealthandEnvironmentatWorkPlace.pdf

[3]https://www.ilo.org/safework/areasofwork/occupational-safety-and-health-management-systems/lang--en/index.htm

[4]https://dgfasli.gov.in/sites/default/files/service_file/Nat-OSH-India-Draft%281%29.pdf

Year	Registered Factories	Employment	Dangerous Occurrences	Fatal Injuries	Non-Fatal Injuries
2012	353684	14910645	1310	1317	28700
2013	340226 (-3.81)	14042410 (-5.82)	1343 (2.52)	1312 (-0.38)	26852 (-6.44)
2014	361994 (6.4)	20034859 (42.67)	1534 (14.22)	1266 (-3.51)	25500 (-5.04)
2015	348429 (-3.75)	16374546 (-18.27)	1091 (-28.88)	1107 (-12.56)	20257 (-20.56)
2016	360949 (3.59)	17376854 (6.12)	700 (-35.84)	1189 (7.41)	5367 (-73.51)
2017	339931 (-5.82)	16409493 (-5.57)	1382 (97.43)	1084 (-8.83)	4866 (-9.33)
2018	364268 (7.16)	18724733 (14.11)	1124 (-18.67)	1154 (6.46)	4528 (-6.95)
2019	355478 (-2.41)	18552909 (-0.92)	1371 (21.98)	1127 (-2.34)	3927 (-13.27)
2020	363442 (2.24)	20298387 (9.41)	634 (-53.76)	1050 (-6.83)	2832 (-27.88)
2021	321578 (-11.52)	17414912 (-14.21)	1058 (66.88)	988 (-5.90)	2803 (-1.02)

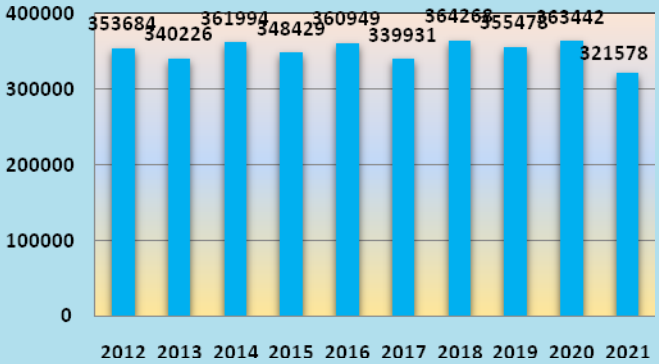
Table: Occupational Safety & Health Data of registered factories (2012-2021)

***Data Source**: The office of the Chief Inspector of Factories (CIF) / Directorate of Industrial Safety & Health (DISH) of States/UTs.*

***N.B.**: i) Figures in the bracket represent percentage change as compared to the previous year.*
ii) For detailed State/UT-wise data and information on data limitations, please refer to Annexure.

Key Findings: The comprehensive analysis of 10-year Occupational Safety & Health (OSH) data reveals a fluctuating trend with a predominantly positive trajectory. Examining these trends in registered factories, employment, dangerous occurrences, fatal injuries, and non-fatal injuries provides insights that suggest both positive strides and challenges in fostering a safer and healthier working environment. The key findings of the analysis are as follows:

1. Registered Factories:
The number of registered factories has shown fluctuations over the years. The overall trend indicates some variability, with both increases and decreases in every alternate year. The years 2014, 2016 and 2018 saw a significant increase of 6.4%, 3.59% and 7.16% respectively, suggesting significant growth in the establishment of factories. This could be due to possible economic expansion or increased industrial activities. The increase in the number of registered factories in the years 2014, 2016, 2018 and 2020 may indicate moderate increase, signaling a recovery or stabilization or may be due to potential factors like policy changes or improved economic conditions. The largest growth of 7.16% in the year 2018 which came just after the year of significant decline i.e. 5.82%. This sharp increase suggests a rebound or positive economic conditions. The largest decline of 11.52% came in the year 2021. This could be due to external shocks, such as the COVID-19 pandemic impacting negatively and rendering closure of a large number of units in the manufacturing sector.

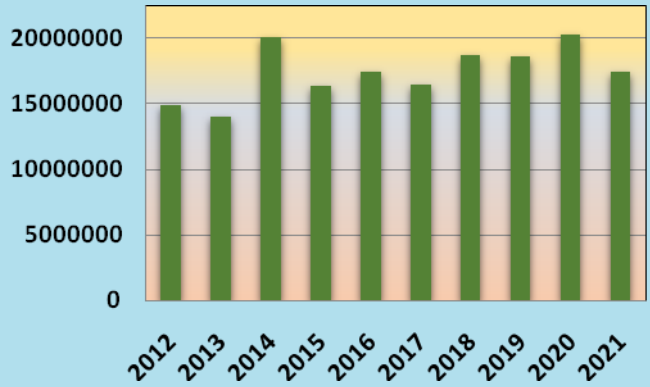


Graph 1: Registered factories in India (2012-2021)

2. Employment:
The employment data reveals a fluctuating pattern, like the factories' data, with periods of growth (2014, 2016, 2018, and 2020) and contraction (2013, 2015, 2017, 2019, and 2021). The employment peak in 2014 marked a significant 42.67% increase; the potential factors contributing to this spike may include government policies, industry-specific initiatives, or economic reforms that stimulated growth and investment in the manufacturing sector. Notably, the year 2014 i.e. the peak employment year and year of highest growth (42.67%) is followed by year 2015 which saw the largest decline of 18.27% and the year of least employment. This may raise concerns about economic factors or industry-specific challenges.

Despite a 9.41% increase in 2020, 2021 witnessed a sharp decline of 14.21%, potentially influenced by external factors such as global economic conditions or the COVID-19 pandemic.

Fluctuations in employment highlight the need for adaptive training programmes to ensure that the workforce is equipped with the necessary skills and knowledge contributing to a safer and more resilient workforce. During periods of rapid employment growth, OSH measures must be actively reinforced to accommodate the influx of new workers. Proactive safety training programmes and effective communication can prevent accidents and injuries associated with a growing workforce.



Graph 2: Employment in Registered factories in India (2012-2021)

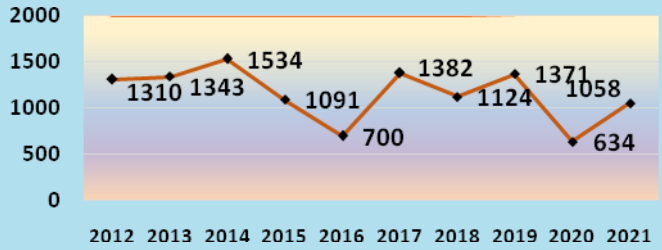
3. Dangerous Occurrences

The data reveals fluctuating trends in Dangerous Occurrences, with a notable decrease in 2015 and 2016, followed by a sudden spike in 2017. Subsequent years witnessed a consistent decline, reaching its lowest point in 2020, but a rebound was observed in 2021.

Over the years, we observe a fluctuating pattern, with some years experiencing a rise and others a decline. In 2013, there was a 2.52% increase in dangerous occurrences compared to the previous year (2012). This moderate rise could be attributed to various factors, such as increased industrial activity. The years 2015 and 2016 stand out with substantial decreases, i.e. 28.88% and 35.84% respectively, showcasing successful safety interventions. The years 2017 and 2019, marked by sharp increases, underscore the need for continuous vigilance and improvement. 2020's dramatic decrease of 53.76% may be attributed to the pandemic's impact on industrial activities.

The year 2021 witnessed a 66.88% increase, indicating a potential setback in the progress made in the preceding year. This surge suggests a rebound in dangerous occurrences, necessitating urgent corrective actions. However, external factors such as economic conditions or pandemic-related disruptions could have influenced these figures.

The year-wise analysis reveals a fluctuating pattern in dangerous occurrences in Indian factories. While there have been notable improvements, sporadic spikes underscore the need for continuous vigilance and improvement in safety protocols.



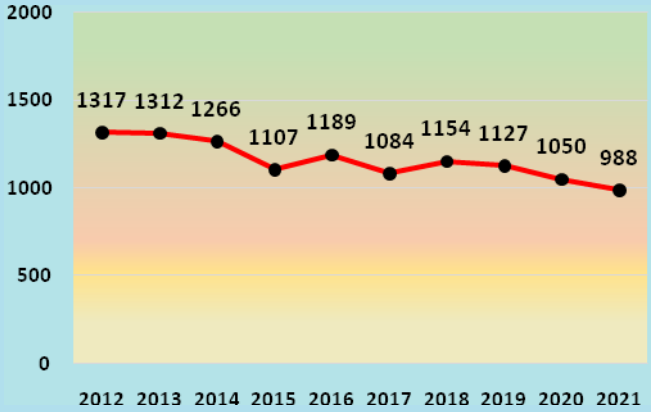
Graph 3: Dangerous Occurrences in Registered factories in India (2012-2021)

4. Fatal Injuries:

There is a consistent decline every year in the no. of total injuries. Each year, the no. of total injuries reported is less than the previous year. There is decline of 24.98 % in the no. of fatal injuries in the registered factories since 2012 to 2021 i.e. fatal injuries in registered factories decreased from 1317 to 988.

The initial years, from 2012 to 2014, witnessed a modest decline in fatal injuries, with a 0.38% reduction in 2013 and a more substantial 3.51% decrease in 2014. A significant reduction occurred in 2015, marked by a 12.56% decrease in fatal injuries. This was immediately followed by an upward spike in 2016 of 7.41%, emphasizing the importance of proactive measures to prevent fatal injuries in factories.

The period from 2018 to 2021 reflected mixed trend, with increase in 2018 (6.46%) followed by decrease in 2019 (-2.34%) and 2020 (-6.83%). The year 2021 continued this trend with a 5.90% decrease in fatal injuries.



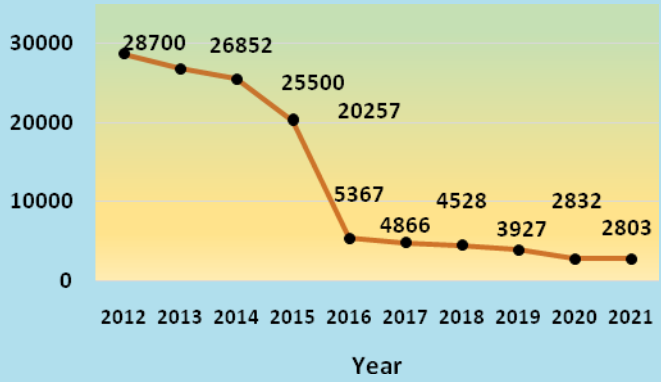
Graph 4: Fatal Injuries in Registered factories in India (2012-2021)

5. Non-Fatal Injuries:

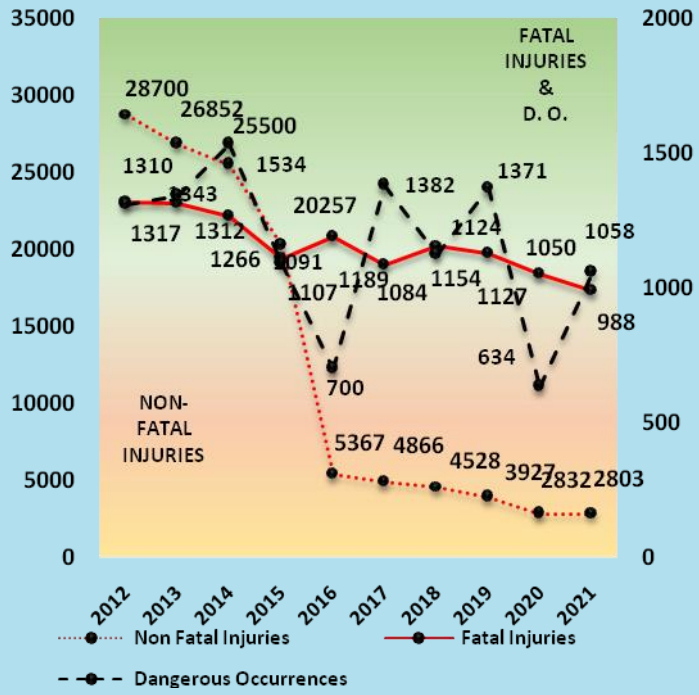
Like Fatal-Injuries, there is a consistent decline every year in the no. of non-fatal injuries. During 2012-2021, the non-fatal injuries in the registered factories decreased by 90.23 % from 28,700 to 2,803. The overall trend reveals a substantial reduction in non-fatal injuries over the years, showcasing a positive impact of safety initiatives in factories.

In 2013, non-fatal injuries decreased by 6.44% compared to 2012. This decline may indicate an improvement in safety measures or increased awareness among workers. The trend continued in 2014 with a 5.04% decrease in injuries. A remarkable 20.56% decrease in 2015 might be attributed to enhanced safety regulations or increased compliance. The year 2016 witnessed a staggering unprecedented 73.51% drop[5] in non-fatal injuries. Although there was a further reduction by 9.33%, the rate of decline slowed in 2017. In 2018 and 2019, the decline continued at a rate of 6.95% and 13.27% respectively.

The year 2020 saw a substantial 27.88% drop, which may partly be attributed to the unprecedented challenges posed by the COVID-19 pandemic. In the year 2021, non-fatal injuries only decreased by 1.02%, suggesting a commendable resilience in safety measures. The slowdown in the rate of decline in recent years (2018-2021) may indicate the need for continuous innovation in safety practices to address emerging challenges. West Bengal recorded a significant decline in non-fatal injuries in 2016 and 2018 compared to previous years, with no reported data for 2017, 2019, 2020, and 2021.



Graph 5: Non-fatal Injuries in Registered factories in India (2012-2021)



Graph 6: Fatal Injuries, Non-fatal Injuries and Dangerous Occurrences in Registered factories in India (2012-2021)

6. Insights & Suggestions: As noted in the article, the overall national trend wrt factories, employment, and fatalities show improvement, the following insights and suggestions may address gaps and further reduce

[5]This might be primarily because West Bengal reported a significant decline in non-fatal injuries in 2016 and 2018 compared to previous years, with no reported data for 2017, 2019, 2020, and 2021. For detailed data, refer Table-5 of Annexure.

fatalities in factories, thereby improving the Occupational Safety and Health (OSH) situation:

***a) OSH data convergence*:**
It is imperative to have OSH data convergence of studies/surveys conducted by various technical division under DGFASLI viz Safety Division, Industrial Hygiene division, Industrial Medicine division and staff Training/Productivity division for effective outcome. OSH data convergence between other verticals of MoL&E viz ESIC for occupational injuries/occupational diseases and joint training programmes on OSH with Central Labour Commissioner (C) and DTNBWE will help in improving safety & health among Organized and unorganized workers respectively.

b) Implementing a robust safety management system*:*
The primary cause of accidents in factories is frequently attributed to the lack of effective implementation and maintenance of safety management systems. Having a robust safety management system is crucial to mitigating most safety risks. A proactive safety approach, including hazard identification and control, regular equipment maintenance, and emergency response planning, along with comprehensive training programmes, regular inspections, adoption of new technologies, and fostering a strong safety culture, is essential to prevent accidents in industrial environments.

c)Promote data-driven decision making*:*
Encourage the use of OSH Statistics and data analysis to inform evidence-based policy decisions and resource allocation for OSH interventions. Establish a continuous monitoring system for OSH data to promptly identify fluctuations and trends. Regularly analyze data to understand the impact of external factors such as economic conditions, policy changes, or global events on OSH indicators. Utilize available data on OSH incidents to identify high-risk areas, trends, and contributing factors, and develop targeted interventions and safety measures based on data analysis.

In this light, it is important to make mention of 'OSH Data Convergence'. This initiative aims to address existing gaps in OSH data and related issues by establishing a convergence mechanism among various stakeholders involved in OSH data management. These stakeholders include the technical divisions of DGFASLI, DGMS, ESIC, CLC (C), MoL&E, and other relevant entities dealing with OSH Data. The envisioned 'OSH Data Convergence' framework seeks to foster collaboration among the aforementioned entities, thereby streamlining the exchange of critical OSH data. By facilitating a cohesive flow of OSH information and insights, this initiative will significantly contribute to informed decision-making processes, and thereby strengthening our commitment to occupational safety and health.

d) Invest in training and awareness programmes:
Train employers, managers, and workers on OSH best practices, emergency procedures, and hazard identification. Conduct regular safety training programmes focusing on sector-specific hazards and safe work practices. Implement continuous education and up skilling initiatives to create a safer and more resilient workforce.

e) Foster collaboration and stakeholder engagement*:*
Encourage collaboration between government agencies, employers, employees, safety experts, and research institutions to share knowledge, best practices, and resources for improving OSH.

f) Promote collaboration and knowledge sharing*:*
Encourage knowledge sharing and best practices among industries, states, and stakeholders. Foster a culture of safety at all levels through collaboration and communication. Support research, development and adoption of new technologies and safety solutions to address emerging risks and challenges in the workplace.

g) Benchmarking Against Global Standards:
Benchmark OSH performance against international standards and best practices. Identify areas where the registered factories in India can align with or exceed global safety benchmarks to enhance overall workplace safety.

h) Technological Solutions:
Explore and implement advanced technologies, such as IoT sensors, wearables, and AI, to monitor workplace conditions and provide real-time feedback. Leverage technology for predictive analytics to prevent accidents.

i) Periodically review and update OSH policies*:*

Align policies with evolving industry standards, technological advancements, and lessons learned from incidents. Ensure that policies are dynamic and responsive to changing circumstances.

7. Conclusion:

The statistical analysis of OSH data from 2012 to 2021 in the registered factories provides valuable insights into the dynamic nature of the industrial landscape. The analysis shows a positive trend, indicating a concerted effort to improve workplace safety. While the data reflects substantial progress, it is crucial to remain vigilant, adapt to changing circumstances, and continuously enhance safety measures to ensure the well-being of the workforce in the years to come. As we navigate economic shifts and industrial advancements, prioritizing the well-being of workers remains a paramount concern for sustainable and responsible industrial growth.

Acknowledgement

The editorial board acknowledges the following for their valuable contribution towards the articles published in INDOSHNEWS.

1. Dr. S. B. Mishra, Director (IH), CLI - Mumbai, DGFASLI
2. Shri Najibullah Adamji, JSO, Statistics Cell, DGFASLI Mumbai

We Nurture Safety Culture
DGFASLI

भारत सरकार
श्रम एवं रोज़गार मंत्रालय

डीजीफासली सुरक्षा कार्ड

अभियांत्रिकी कार्य

व्यक्तिगत सुरक्षा उपकरण

वर्तमान समय में सभी उद्योगों में अभियांत्रिकी कार्य किया जाता है। उद्योगों में की जाने वाली ज्यादातर प्रक्रियाएं जैसे कटिंग, चिपिंग, ब्रेज़िंग, मशीनिंग, ग्राइंडिग इत्यादि अभियांत्रिकी कार्य में आते है। उद्योगों में ज्यादातर दुर्घटनाएं अभियांत्रिकी कार्य के दौरान होती है।

जब इस क्षेत्र में कार्य स्थल पर विद्यमान खतरों को प्रशासनिक और अभियात्रिंकी विधि से नियंत्रित न किया जा सके तब कामगारों की सुरक्षा के लिए अंतिम उपाय के तौर पर व्यक्तिगत सुरक्षा उपकरणों का प्रयोग किया जाता है। व्यक्तिगत सुरक्षा उपकरणों से कार्यस्थल पर विद्यमान खतरों को खत्म नहीं किया जा सकता अपितु यह कार्यस्थल पर विद्यमान खतरों एवं कामगारों के मध्य एक कवच का कार्य करता है। उचित एवं उपयुक्त व्यक्तिगत सुरक्षा उपकरणों का चुनाव अत्यंत महत्वपूर्ण है। अभियांत्रिकी कार्य के दौरान विद्यमान खतरे से अपने शरीर को सुरक्षित रखने के लिए सामान्यतः अभियांत्रिकी कार्य में निम्न प्रकार के व्यक्तिगत सुरक्षा उपकरणों का प्रयोग करते है।

सिर की सुरक्षा

कार्य स्थल पर किसी वस्तु के गिरने, किसी स्थिर या गतिमान वस्तु से अचानक टकराने से, सिर को सुरक्षित रखने के लिए कामगारों को सुरक्षा हेलमेट अवश्य पहनना चाहिए।

आँखों व चेहरे की सुरक्षा

कार्य स्थल पर अभियांत्रिकी कार्य के दौरान पदार्थ, उड़ते हुए कण, रसायन, उत्पन्न गैस, वाष्प व अत्यधिक तापमान से आंख व चेहरे को सुरक्षित रखने के लिए कामगारों को सुरक्षा चश्मे या फेस शील्ड का अवश्य प्रयोग करना चाहिए। सुरक्षा चश्मे व फेस शील्ड को उचित क्षमता व माप का होना चाहिए। कार्यस्थल पर सम्भावित खतरों के दृष्टिगत, व्यक्तिगत सुरक्षा उपकरणों का चयन किया जाना चाहिए व इनकी नियमित जाँच व सफाई की जानी चाहिए।

कानों की सुरक्षा

कार्य स्थल पर मशीन व अन्य भारी उपकरणों के प्रचालन के दौरान उत्पन्न अत्यधिक तीव्र ध्वनि से कानों को सुरक्षित रखने के लिए इयर प्लग/इयर मफ इत्यादि का प्रयोग करना चाहिए।

याद रखें! तीव्र ध्वनि से उत्पन्न खतरों से कानों की साधारण रूई द्वारा सुरक्षा नहीं की जा सकती है।

श्वास की सुरक्षा

कार्य स्थल पर धूल, गैस, धुआँ व खतरनाक रसायन इत्यादि से श्वसन प्रणाली पर होने वाले हानिकारक प्रभाव से सुरक्षा के लिए गैस मास्क, रेस्परेटरी मास्क इत्यादि का प्रयोग करना चाहिए।

याद रखें! मास्क उचित माप व पूर्ण रूप से फिट होना चाहिए।

हाथों की सुरक्षा

कार्य स्थल पर अभियात्रिंकी कार्य के दौरान हाथों में अधिकतर चोट लगती है क्योंकि ज्यादातर कार्यों में हाथ का ही उपयोग किया जाता है। अतः कार्य स्थल पर कटने, खरोंच लगने, चुभने, रसायन के प्रभाव या अत्यधिक गर्म वस्तु के संपर्क में आने से हाथों व बाहों को सुरक्षित रखने के लिए उचित क्षमता व आकार के दस्ताने प्रयोग करना चाहिए।

शरीर की सुरक्षा

कार्य स्थल पर अत्यधिक तापमान, खतरनाक रसायन, अत्याधिक गर्म वस्तुओं व द्रवों के संपर्क में आने से शरीर के किसी अंग पर खतरे की सम्भावना हो तो कामगारों को उचित लैबकोट, एप्रेन, कवर ऑल इत्यादि का प्रयोग अवश्य करना चाहिए।

पैरों की सुरक्षा

कार्य स्थल पर किसी नुकीली व भारी वस्तु के, खतरनाक रसायनों व गर्म वस्तु के गिरने से पैरों को सुरक्षित रखने के लिए उचित क्षमता व मानक के सुरक्षा जूते का प्रयोग कामगारों को करना चाहिए। ऐसे जूतों का सोल/तला मजबूत व उचित क्षमता का होना चाहिए।

गिरने से सुरक्षा

कार्य स्थल पर कामगारों को उचाँई से गिरने से सुरक्षित रखने के लिए सुरक्षा पेटी, सुरक्षा रस्सी, फुल बॉडी हॉरनेस इत्यादि का प्रयोग नियमानुसार व निर्देशानुसार करना चाहिए।

याद रखें! व्यक्तिगत सुरक्षा उपकरण की अपनी एक सीमा होती है एवं यह तभी सुरक्षित रखता है जब यह कार्यक्षम एवं उचित अवस्था में हो।
व्यक्तिगत सुरक्षा उपकरण कार्य स्थल पर कामगारों की सुरक्षा का अतिंम उपाय है।

अधिक जानकारी के लिए संपर्क करें –
सूचना कक्ष
कारखाना सलाह सेवा एवं श्रम संस्थान महानिदेशालय
सायन, मुम्बई–400022
वेबसाइट – www.dgfasli.nic.in

INTERNATIONAL VISION ZERO CONFERENCE ON CONSTRUCTION SAFETY

Left to Right:

Shri G.P. Nijalingappa, Deputy Director General, DGFASLI, Mumbai, Dr. Sven Timm, Director of Central Prevention Division, DGUV, Germany, Ms. Michaela Küchler, Consul General of the Federal Republic of Germany to the Republic of India, Chennai, Prof. Venkatesh Balsubramanian, Department of Engineering Design, IIT Madras, Prof.Karl-Heinz Noetel, President ISSA Construction, Germany

The Regional Labour Institute Chennai organised an International Vision Zero Conference on Construction Safety. The conference was held on 08.02.2023 at AMM Arunachalam Auditorium, IIT Madras, in association with DGUV - Deutsche Gesetzliche Unfall Versicherung (German Social Accident Insurance). The conference was inaugurated by the Chief Guest Prof. Karl-Heinz Noetel, President ISSA Construction, Germany. The other dignitaries present on this occasion were Prof. V. Kamakoti, Director, IIT Madras, Dr Seven Timm, Vice President, IISA Information, Director of Central Prevention Division, DGUV, Germany, Shri Michaela Küchler, Consul General of the Federal Republic of Germany to the Republic of India, Chennai, Shri G.P. Nijalingappa, Deputy Director General, DGFASLI, Mumbai and Dr Venkatesh Balsubramanian, Professor, IIT Madras.

The dignitaries emphasized and highlighted on the importance of Occupational Safety and Health in Construction Industries and application of knowledge at workplace to attain the highest productivity preserving human life and environment.

Welcome address delivered by Shri G.P. Nijalingappa, Dy. Director General, DGFASLI, Mumbai and vote of thanks delivered by Dr Venkatesh Balsubramanian, Professor, IIT Madras on this occasion. The conference was attended by 75 delegates.

Central Labour Institute, Mumbai

- The Industrial Medical division conducted 29th Associate Fellow of Industrial Health (AFIH) Certificate Course 2023 from 3rd April, 2023 to 10th July, 2023. Seventy two participants attended the programme.

- The Industrial Medical division conducted three days workshop on "ILO Radiograph & Occupational Lung Diseases" for Doctors from 3rd to 5th July, 2023. Ten participants from ten organizations attended the programme.

- The Industrial Medical division conducted one week training programme on 'Occupational Health Practice for Nurses, Health/Medical Assistants' from 30th October, 2023 to 3rd November, 2023. Twelve participants from eleven organizations attended the programme.

- The Industrial Medical division conducted two days in-plant training programme on "Basic course on Occupational Heath and Industrial Act for Railway Medical Officers' from 20th to 21st November, 2023. Forty seven participants from one organization attended the programme.

- The Industrial Medical division conducted training programme on 'Occupational Health Practice for Nurses, Health/Medical Assistants' from 30thOctober, 2023 to 3rd November, 2023. Twelve participants from eleven organizations attended the programme.

- The Industrial Medical division conducted two days in-plant training programme on "Basic course on Occupational Heath and Industrial Act for Railway Medical Officers' from 20th to 21st November, 2023. Forty seven participants from one organization attended the programme.

- The Staff training & Productivity division conducted three days specialized training programme on 'Effective Education & Training on participative Safety & Health in Hazardous process Industries' from 10th to 12th January, 2023. Twenty six participants from three organizations attended the programme.

- The Staff training & Productivity division conducted three days Specialized training programme on 'Industrial Safety & Health Management to reduce injures and accidents in Hazardous Process Industries' from 13th to 15th February, 2023. Twenty participants from two organizations attended the programme.

- The Staff training & Productivity division conducted In-plant training on 'Behaviour Based Safety at M/s. Kanoria Chemicals & Industries Ltd' on 6th March, 2023. Twenty seven participants from one organization attended the programme.

- The Staff training & Productivity division conducted three days training programme on 'Role of Effective Employee Participation in improving OSH' from 24th to 26th April, 2023. Twenty participants from three organizations attended the programme.

- The Staff training & Productivity division conducted three days training programme on 'Effective Communication a tool for improving Safety & Health at Workplace' from 10th to 12th July, 2023. Eighteen participants from ten organizations attended the programme.

- The Staff training & Productivity division conducted three days specialized training programme on 'Role of Effective Employee Participation in Improving Occupational Safety & Health in Hazardous Process Industries' from 22th to 24th August, 2023. Twenty one participants from three organizations attended the programme.

- The Staff training & Productivity division conducted three days specialized training programme on 'Role of Effective Employee Participation in Improving Occupational Safety & Health in Hazardous Process Industries' from 4th to 6th September, 2023. Twelve participants from eleven organizations attended the programme.

- The Staff training & Productivity division conducted half day training workshop at DGFASLI, Mumbai for sensitizing ASO/SO's of DGFASLI for Mandatory Training on 5th October, 2023. Seven participants attended the programme.

- The Staff training & Productivity division conducted three days training programme on 'Effective Safety Communication and Commitment for improving Occupational Safety and Health in Chemical Factories at their workplace' from 18th to 20th October, 2023. Forty nine participants from seven organizations attended the programme.

- The Staff training & Productivity division conducted three days training programme on 'Building Safety Culture and Safety Leadership' from 6th to 8th November, 2023. Twenty two participants from sixteen organizations attended the programme.

- The Staff training & Productivity division conducted three days training programme on 'Role of Effective Employee participation in improving Occupational Safety & Health in Hazardous Process Industries' from 22nd to 24thNovember, 2023. Seven participants from two organizations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi ka Amrit Mahotsav) Major Accident Hazards Control Advisory division conducted online awareness campaign for Industrial workers on 1st January, 2023. Seventy eight participants attended the programme.

- The Major Accident Hazards Control Advisory division conducted training programme on 'Management of Hazardous Substances in Factories' from 8th to 10th February, 2023. Twenty five participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi ka Amrit Mahotsav) Major Accident Hazards Control Advisory division conducted online awareness campaign for Industrial workers on 17th February, 2023. Two Hundred thirty five participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi ka Amrit Mahotsav) Major Accident Hazards Control Advisory division conducted online awareness campaign for Industrial workers on 6th and 8th March, 2023. Total two hundred fifteen participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi ka Amrit Mahotsav) the Major Accident Hazards Control Advisory division conducted PPE awareness campaign for Industrial workers on 13th and 20th April, 2023. Total one hundred ninety nine participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi ka Amrit Mahotsav) Major Accident Hazards Control Advisory division conducted online awareness campaign for Industrial workers on 10th and 19th May, 2023. Total two hundred six participants attended the programme.

- The Major Accident Hazards Control Advisory division conducted training programme on Major Accident Hazards Control in Factories from 12th to 14th June, 2023. Thirty five participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) RTL/NRTL division conducted half-day awareness campaign for Industrial Workers on 'Occupational Safety, Health and Productivity in Industries' on 13th January, 2023. Seven participants from one organization attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) RTL/NRTL division conducted half-day awareness campaign for Industrial Workers on 'Occupational Safety, Health and Productivity in Industries' on 23rd August, 2023. Fifty participants from one organization attended the programme.

Respiratory Testing Laboratory (RTL)

- RTL is equipped with equipment/instruments for testing of different respiratory personal protective equipment like dust respirator, breathing air cylinders etc. RTL has tested a total number of 98 nos. Breathing air cylinders and 09 nos. of dust masks for the period from January to December, 2023.

Non-Respiratory Testing Laboratory (NRTL)

- NRTL is equipped with equipment / instruments for testing of different non respiratory personal protective equipment like safety helmets, safety shoes, safety goggles, safety belts, safety gloves etc. NRTL has tested a total number of 11 nos. of safety goggles, safety hand gloves, clothing and 9nos. of safety shoes, safety belts for the period from January to December, 2023.

Regional Labour Institute, Chennai

- Industrial Medicine division conducted Associate Fellow of Industrial Health (AFIH)-2023 from 3rd April, 2023 to 3rd July, 2023. Forty seven participants attended the program.

- Industrial Safety division conducted an In-plant training program on 'Behaviour Based Safety (BBS) at M/s. DAICEL Safety Systems India Pvt. Limited on 14th September, 2023. Twenty seven participants attended the programme.

- Industrial Safety division conducted three days training program on "Process Safety Management & its Elements" from 25th to 27th September, 2023. Nineteen participants attended the programme.

- Industrial Hygiene division conducted three days training program on "Management of Workplace Contaminants in Industry" from 6th to 8th November, 2023. Four participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted three half day online awareness campaigns for Casual workers / Contract workers employed in Hazardous Process Industries on 6th, 13th and 30th January, 2023. Total two hundred fifteen participants from three organizations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted three half day online awareness campaigns for Casual workers / Contract workers employed in Construction Industries on 9th and 13th February, 2023. Total one hundred seventy seven participants from two organisations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day online awareness campaign for Casual workers / Contract workers employed in Hazardous Process Industries on 16th February, 2023. One hundred twenty three participants from one organization attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted two half day online awareness campaigns for Casual workers / Contract workers employed in Construction Industries on 16th and 21st March, 2023. One hundred eighty seven

participants from two organisations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day online awareness campaign for Casual workers / Contract workers employed in Hazardous Process Industries on 24th March, 2023. Seventy eight participants from one organization attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted two half day online awareness campaigns for Casual workers / Contract workers employed in Construction Industries on 19th and 28th April, 2023. Two hundred seventy participants from two organisations attended the programme respectively.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day online awareness campaign for Casual workers / Contract workers employed in Hazardous Process Industries on 20th April, 2023. Seventy eight participants from one organization attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted three half day online awareness campaigns for Casual workers / Contract workers employed in Hazardous Process Industries on 9th, 26th and 30th May, 2023. Two hundred five participants from three organisations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted three half day online awareness campaign for Casual workers / Contract workers employed in Construction Industries on 15th 19th and 31st May, 2023. Total two hundred thirty two participants from three organisations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Hygiene division conducted half day online awareness campaign for Casual workers / Contract workers employed in Construction Industries on 2nd June, 2023. Two hundred fifty participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Hygiene division conducted half day online awareness campaign for Casual workers / Contract workers employed in Hazardous Process Industries on 15th June, 2023. Ninety participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day online awareness campaign for Casual workers / Contract workers employed in Construction Industries on 30th June, 2023. One hundred twenty five participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day online awareness campaign for Casual workers / Contract workers employed in Hazardous Process Industries on 19th June, 2023. One hundred twenty one participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted two half day online awareness campaign for Casual workers / Contract workers employed in Hazardous Process Industries on 4th and 24th July, 2023. Total one hundred thirty nine participants from two organisations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted two half day online awareness campaign for Casual workers / Contract workers employed

in Construction Industries on 6th and 24th July, 2023. Total one hundred ninety two participants from two organisations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Hygiene division conducted four half day online awareness campaign for Casual workers / Contract workers employed in Hazardous Process Industries on 2nd,11th,16th and 28th August, 2023. Total one hundred sixty five participants from four organisations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted three half day offline awareness campaign for Casual workers / Contract workers employed in Hazardous Process Industries on 18th, 25th and 29th August, 2023. Total forty seven participants from three organisations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day offline awareness campaign for Casual workers / Contract workers employed in Hazardous Process Industries on 6th September, 2023. Twenty three participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day offline awareness campaign for Casual workers / Contract workers employed in Hazardous Process Industries on 4thOctober, 2023. Thirty participants attended the programme.

Regional Labour Institute, Kanpur

- To commemorate the 75th Anniversary of Indian Independence day (Azadi ka Amrit Mahotsav) Industrial Medical division conducted five half day online awareness campaigns on 'Occupational Safety, Health and Productivity' in Industries on 4th ,18th, 19th, 20th and 25th January, 2023. Eight hundred fifteen participants from seven organizations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi ka Amrit Mahotsav) Industrial Hygiene division conducted four half day online awareness campaigns on 'Occupational Safety, Health and Productivity in Industries' on 5th,12th,16th and 17thJanuary, 2023. Eight hundred ten participants from eleven organizations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi ka Amrit Mahotsav) Industrial Safety division conducted half day online awareness campaigns on 'Occupational Safety, Health and Productivity in Industries' on 9th January, 2023. Eighty participants from one organization attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi ka Amrit Mahotsav) Industrial Medical division conducted five half day online awareness campaigns on 'Occupational Safety, Health and Productivity in Industries' on 2nd , 3rd ,6th, 9th and 17th February, 2023. Seven hundred ninety six participants from fifteen organizations attended the programme.

- The Institute conducted half day training programme on “Occupational health & Hygiene on 18th March, 2023. Ninety participants from one organization attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi ka Amrit Mahotsav) Industrial Medical division conducted five half day online awareness campaigns on ‘Occupational Safety, Health and Productivity in Industries’ on 6th, 8th ,9th,10th and 24th, March, 2023. Total eight hundred eighty five participants from ten organizations attended the programme.

- Industrial Medicine division conducted Associate Fellow of Industrial Health (AFIH)-2023 from 3rd April, 2023 to 3rd July, 2023. Forty participants attended the program.

- To commemorate the 75th Anniversary of Indian Independence (Azadi ka Amrit Mahotsav) Industrial Medical division conducted seven half day online awareness campaigns on ‘Occupational Safety, Health and Productivity in Industries’ on 5th,13th,18th, 19th,20th, 21st and 25th, April, 2023. Total seven hundred fifty participants from eleven organizations attended the programme.

- The Institute conducted three day workshop on “Basic Life support and recent updates in First-aid procedure in Occupational Health” from 26th to 28th April, 2023. Twenty five participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi ka Amrit Mahotsav) Industrial Medical division conducted six half day online awareness campaigns on ‘Occupational Safety, Health and Productivity in Industries’ on 3rd, 4th, 15th, 16th, 18th and 24th, May, 2023. Total nine hundred ninety participants from nineteen organizations attended the programme.

- The Institute conducted half day online training programme on “Occupational Safety & Health Audit” from12th to 14th June, 2023. Sixteen participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi ka Amrit Mahotsav) Industrial Medical division conducted eight half day online awareness campaigns on ‘Occupational Safety, Health and Productivity in Industries’ on 2nd, 7th, 8th, 19th, 20th , 21st, 22nd and 26thJune,2023. Total four thousand four hundred seventy eight participants from thirteen organizations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi ka Amrit Mahotsav) Industrial Medical division conducted half day online awareness campaign on ‘Occupational Safety, Health and Productivity in Industries’ on 6th, July, 2023. One hundred twenty participants from one organization attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi ka Amrit Mahotsav) Industrial Hygiene division conducted three half day online awareness campaigns on ‘Occupational Safety, Health and Productivity in Industries’ on 12th, 24th and 25th July, 2023. Total five hundred fifty one participants from fourteen organizations attended the programme.
- To commemorate the 75th Anniversary of Indian Independence (Azadi ka Amrit Mahotsav) Industrial Safety division conducted half day online awareness campaign on ‘Occupational Safety, Health and Productivity in Industries’ on 14th July, 2023. Two hundred participants from four organizations attended the programme.

- The Institute conducted three days training programme on “Occupational health Practice for Nurses, Pharmacists, Allied Healthcare professional and Medical Assistants” from16th to 18th August, 2023. Ten participants from one organisation attended the programme.

- The Institute conducted one month certificate course in ‘Safety & Health for Supervisors’ to be Employed in Hazardous Process Industries under Section 41c (b) of the Factories Act, 1948 from 21st August, 2023 to 18th

September, 2023. Six participants from one organisation attended the programme.

- The Institute conducted three day training programme on “Safety Audit” from 8th to 10th August, 2023. Twenty three participants from one organisation attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi ka Amrit Mahotsav) Industrial Safety division conducted six half day online awareness campaigns on ‘Occupational Safety, Health and Productivity in Industries’ on 3rd, 4th, 7th, 10th, 14th and 17th, August, 2023. Four hundred twelve participants from eleven organizations attended the programme.

- The Institute conducted one day training programme on “Effectiveness of Safety Committee National Policy on Occupational Health” on 15th September, 2023. Six participants attended the programme.

- The Institute conducted one day training programme on “Machine Safety” on 29th September, 2023. Twenty three participants attended the programme.

- The Institute conducted three day workshop on “Medical Surveillance and Bio Monitoring for Prevention on Occupational Diseases” from 20th to 22nd September, 2023. Eight participants attended the programme.

- The Institute conducted three day training programme on “Construction Safety” from 4th to 6th October, 2023. Eleven participants attended the programme.

- The Institute conducted three day training programme on “Construction Safety” from 9th to 11th October, 2023. Five participants attended the programme.

- The Institute conducted one day training programme on “Industrial Hygiene Techniques” on 8th November, 2023. Six participants attended the programme.

- The Institute conducted three day training programme on “Basic Life Support and First Aid Procedures” from 15th to 17th November, 2023. Nine participants attended the programme.

- The Institute conducted three day training programme on “Work Permit system at workplace” from 20th to 22nd November, 2023. Five participants the programme.

- The Institute conducted three day training programme on “Safe Use of Lifting Equipments and Accessories” from 22nd to 24th November, 2023. Ten participants attended the programme.

Regional Labour Institute, Faridabad

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted eight half-day online awareness Campaigns for Industrial Workers on Occupational Safety, Health and Productivity in Industries on 5th, 10th, 11th, 17th, 19th, 21st, 28th and 30th, January 2023.Total one thousand two hundred thirty three participants from seventeen organizations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted fifteen half-day online awareness campaigns for Industrial Workers on ‘Occupational Safety, Health and Productivity in Industries’ on 2nd, 8th,9th,10th,17th,23rd,27th and 28th, February 2023. Total five hundred fifty two participants from fourteen organizations attended the programme.

- The Institute conducted half day an in-plant training programme on “Safety Aspects in Scaffolding Erection and Dismantling” on 9th March, 2023. Seventeen participants from one organization attended the programme.

- The Institute conducted half day an in-plant training programme on “Safety and Health” on 16th March, 2023. Thirty one participants from one organization attended the programme.

- To commemorate the 75thAnniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted nine half-day awareness campaigns for Industrial Workers on ‘Occupational Safety, Health and Productivity in Industries’ on 4th,6th, 10th, 15th, 16th, 24th and 25th, March, 2023. Total seven hundred eighty four participants from twelve organizations attended the programme.
- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted twelve half-day online awareness campaigns for Industrial Workers on ‘Occupational Safety, Health and Productivity in Industries’ on 11th, 12th, 14th, 17th, 18th, 19th, 27th and 28thApril, 2023. Total seven hundred fifty four participants from fifteen organizations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted ten half-day online awareness campaigns for Industrial Workers on ‘Occupational Safety, Health and Productivity in Industries’ on 1st, 2nd, 5th, 9th, 10th, 15th, 29th and 30th, May, 2023. Total three hundred thirty eight participants from nine organizations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted thirteen half-day online awareness campaigns for Industrial Workers on ‘Occupational Safety, Health and Productivity in Industries’ on 2nd, 5th, 7th, 14th, 23rd, 28th and 30thJune, 2023. Total five hundred fifty four participants from fourteen organizations attended the programme.

- The Institute conducted an in-plant training programme at M/S Oriental Carbon & Chemicals Ltd., Dharuhera, Rewari, Haryana on 26th July 2023. The training programme was attended by twenty nine participants from the organization.

- The Institute conducted an in-plant training programme at M/S Oriental Carbon & Chemicals Ltd., Dharuhera, Rewari, Haryana on 27th July 2023. The training programme was attended by nineteen participants from the organization.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted fourteen half-day online awareness campaigns for Industrial Workers on ‘Occupational Safety, Health and Productivity in Industries’ on 3rd, 7th, 8th, 20th, 27thand 28th, July, 2023. Total five hundred sixty six participants from eleven organizations attended the programme.

- The Institute conducted one day training programme on “Role & Responsibilities of Safety Supervisors” on 23rd August, 2023. Twenty eight participants from eleven organizations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted six half-day offline awareness campaigns for Industrial Workers on ‘Occupational Safety, Health and Productivity in Industries’ on 1st, 4th, 9th, 11th, 19th and 26th August, 2023. Total five hundred ninety seven participants from eleven organizations attended the programme.

- The Institute conducted three-days training programme on “Occupational Safety and Health Audit” on 30th August, 2023 to 1stSeptember, 2023. Twenty eight participants from three organizations attended the programme.

- The Institute conducted one-day training programme on “Ways for effective safety committee meetings” on 4th September, 2023. Twenty one participants from eleven organizations attended the programme.

- The Institute conducted three-days training programme on “Workshop for Safety Officers” from 9thto 11th October, 2023. Nine participants from seven organizations attended the programme.

- The Institute conducted one-month ‘Certificate Course for Supervisors’ in Hazardous Process Industries on 28th November, 2023 to 27th December, 2023. Eleven participants from five organizations attended the programme.

Regional Labour Institute, Kolkata

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted five half day online awareness campaigns for Casual workers/Contract workers employed in Hazardous Industries on 4th, 11th, 12th, 24th and 27th January, 2023. Total one thousand one hundred sixty participants from five organisations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted two half day offline training on “General Safety Awareness” to Casual workers/Contract workers employed in Construction Industries on 15th and 16th January, 2023. Total three hundred sixty eight participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day offline awareness campaign for Casual workers/Contract workers employed in Hazardous Industries on 12th January, 2023. Total one hundred fifty participants from one organization attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day offline training programme on “General Safety Awareness” to Casual workers/Contract workers of employed in Hazardous Industries’ on 28th January, 2023. Total two hundred thirty eight participants from two organizations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) the Industrial Safety division conducted half day online awareness campaign for Casual workers/Contract workers employed in Hazardous Industries on 6th February, 2023. One hundred sixty participants from one organization attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day online awareness campaign for Casual workers/Contract workers employed in Construction Industries on 6th February, 2023. Forty participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day online training on “Work at Height” to Casual workers/Contract workers employed in Construction Industries, on 6th February, 2023. Twenty five participants from one organization attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted three half day online awareness campaigns for Casual workers/Contract workers employed in

Hazardous Industries on 10th, 13th and 27th February, 2023. Total seven hundred forty two participants from ten organizations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day online awareness training programme on “Dust Exposure as Occupational Health Hazard and its Preventive Measures” in Hazardous Industries” on 16th February, 2023. Four hundred ninety participants from twenty seven organizations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day offline training “General Safety Awareness & Use of PPEs” to Casual workers/Contract workers employed in Construction Industries on 23rd February, 2023. Fifty two participants from three organizations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day onsite awareness campaign on ‘Occupational Safety, Health and Productivity in Industries for Industrial Workers’ on 25th February, 2023. Fifty participants from one organization attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day onsite awareness campaign on ‘Occupational Safety, Health and Productivity in Industries for Industrial Workers’ on 27th February, 2023. One hundred sixty participants from two organizations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day offline training on **“**General safety awareness and use of PPE's**”** to Casual workers/Contract workers employed in Construction Industries on 9th March, 2023. Eighty seven participants from three organizations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day offline training on **“**General safety awareness**”** to Casual workers/Contract workers employed in Hazardous Industries on 10th March, 2023. Thirty nine participants from one organization attended the programme.

- The Institute conducted three days training programme on “Safety & Health Awareness for the Members of the Safety Committee” from 15th to 17th March, 2023. Thirty six participants from six organizations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day online training on **“**General safety awareness**”** to Casual workers/Contract workers employed in Hazardous Industries on 22nd March, 2023. Twenty seven participants from five organizations attended the programme.

- The Institute conducted one day training programme on ‘Defensive Driving & Ride Safe’ on 28th March, 2022. Thirty six participants from eleven organizations attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted two half day online training programs on **“**General safety awareness**”** to Casual workers/Contract workers employed in Construction Industries on 29th and 31st March, 2023. Total two hundred forty eight participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day offline training on “Hazardous Process Industries” to Casual workers/Contract workers employed in

Hazardous Industries on 30th March, 2023. Ninety two participants from one organization attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day offline training on "Occupational Safety, health and Productivity in Hazardous Industries" to Casual workers/Contract workers employed in Hazardous Industries on 31st March, 2023. Thirty participants from one organization attended the programme.

- The Institute conducted three months Associated Fellow of Industrial Health (AFIH) course commenced from 1st April to 30th June, 2023. Twenty nine participants from twenty nine organizations attended the course.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted two half day online training programs on "General Safety Awareness to Casual workers/Contract workers employed in Hazardous Process Industries on 2nd and 12th April, 2023. Total fifty six participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day online training on "General Safety Awareness to Casual workers/Contract workers employed in Construction Industries' on 13th April, 2023. One hundred twenty five participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day online training on 'Fire Prevention and Control to Casual workers/Contract workers employed in Hazardous Industries' on 19th April, 2023. Seventy one participants from one organization attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted two half day online training on 'General Safety Awareness to Casual workers/Contract workers employed in Hazardous Process Industries' on 4th & 18th May, 2023. Total three hundred seventy one participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day online training on 'General Safety Awareness to Casual workers/Contract workers employed in Construction Industries' on 30th May, 2023. One hundred seventy five participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day online training on 'General Safety Awareness to Casual workers/Contract workers employed in Hazardous Industries' on 2nd June, 2023. One hundred fifty two participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted three half day online training programs on 'General Safety Awareness to Casual workers/Contract workers employed in Construction Industries' on 8th, 9th and 15th June, 2023. Total three hundred forty five participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day online training on 'General Safety Awareness to Casual workers/Contract workers employed in Hazardous Industries' on 9th June, 2023. One hundred sixty eight participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division

conducted two half day online training on "General Safety Awareness to Casual workers/Contract workers employed in Construction Industries on 12th and 25th July, 2023. One hundred thirty participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day onsite 'OSH awareness programme to Casual workers/Contract workers employed in Hazardous Process Industries' on 31st July, 2023. Twenty six participants from two organizations attended the programme.

- The Institute conducted three days training programme on "Accident Investigation, Analysis and Reporting" from 11th to 13th September, 2023. Nine participants from four organizations attended the programme.

- The Institute conducted three days training programme on "Safety Management System in Industry" from 4th to 6th October, 2023. Three participants from one organization attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) Industrial Safety division conducted half day onsite training on 'OSH awareness programme to Casual workers/Contract workers employed in Hazardous Process Industries' on 13th October, 2023. Sixty participants from one organization attended the programme.

Regional Labour Institute, Shillong

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav) the institute conducted half day online training programme on 'Accident Prevention at Workplace in hazardous industries' on 4th January, 2023. Thirty six participants attended the programme.

- The institute conducted half day online training programme on 'Accident Prevention at Workplace' for construction workers on 11th January, 2023. Thirty four participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the Institute conducted half day online training programme in hazardous industries 'OSH awareness for prevention of accident' on 18th January, 2023. Thirty two participants attended the programme.

- The institute conducted half day online training programme on 'Awareness of Occupational Safety, Health & Environment' for construction workers on 25th January, 2023. Thirty nine participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav),Institute conducted half day online training programme on 'Accident Investigation and Reporting' for hazardous industries worker on 16th February, 2023. Thirty participants attended the programme.

- The institute conducted two half day online training programme for the workers working in construction industries on 'Safety while working with various Tools' on 17thand 24thFebruary, 2023. Total sixty two participants attended the programme.

- The institute conducted half day online training programme for the workers working in hazardous industries on 'Safety while working with various Tools' on 23rd February, 2023.Twenty seven participants attended the programme.

- The institute conducted half day in-plant training programme on 'Workers participation in OSH and Importance of Safety Committee' at M/s. Goldstone Cement, Jaintia Hills Dist.' on 10th March 2023. Fifty nine participants attended the programme.

- The institute conducted half day in-plant training programme on 'Workers participation for reduction of incident' at M/s. Dalmiya Cement, Jaintia Hills Dist. on 11th March, 2023. Eighty two participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the institute conducted half day online training programme on 'Importance of Safety Committee and role of the members' for construction workers on 17th March, 2023. Twenty seven participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the institute conducted half day online training programme for construction industries on 'Workers participation for Safety and Health Awareness,' on 24th March, 2023. Thirty four participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the institute conducted half day online training programme for hazardous industries on 'Accident Reporting and Prevention', on 11th April, 2023. Forty two participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the institute conducted half day online training programme for hazardous industries on 'Accident Investigation', on 12th April, 2023. Twenty six participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the institute conducted half day in-plant training programme on 'Safety awareness by hazard identification' for hazardous industries worker of M/s Bitchem, Ri-bhoi, on 20th April, 2023. Eighteen participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the institute conducted half day online training programme for construction industries on 'Accident Reporting and Accident Prevention', on 25th April, 2023. Thirty two participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the institute conducted half day online training programme for construction industries on 'Accident Investigation', on 26th April, 2023. Thirty seven participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the institute conducted two half day online training programmes for hazardous industries on 'Importance of Safety & Health at Workplace', on 16thand 18th May, 2023. Total forty eight participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the institute conducted two half day online training programmes for construction industries on 'Importance of Safety & Health at Construction Workplace',

on 29th and 30th May, 2023. Total fifty six participants attended the programme.

- The institute conducted half day in-plant training programme at M/s. Magic Coke, Nongsning, East Jaintia Hill Dist. on 'Importance of Safety & Health at Workplace' on 6th June, 2023. Twenty seven participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the institute conducted two half day online training programmes for construction industries on 'Occupational Safety & Health Awareness', on 14th and 30th June, 2023. Total sixty six participants attended the programme.

- The institute conducted half day in-plant training programme for 'Workers in Hazardous Industry' on 22nd June, 2023 at M/s Marak Industry at Samanda Rongkem, East Garo Hills. Fifty nine participants attended the programme.

- The institute conducted two half day online training programmes for hazardous industries on 'Occupational Safety, Health and Productivity in Industries' on 4th and 20th July, 2023. Total sixty two participants attended the programme.

- The institute conducted two half day online training programmes for Construction industries on 'Occupational Safety, Health and Productivity in Industries' on 10th and 22nd July, 2023. Total sixty two participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the institute conducted half day online training programme for hazardous industries on 'Hazard Identification and Prevention' on 3rd August, 2023. Twenty one participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the institute conducted half day online training programme for construction industries on 'Hazard Identification and Prevention' on 7th August, 2023. Twenty three participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the institute conducted half day online training programme for hazardous industry on 'Importance of Occupational Safety and Health in Industry' on 14th August, 2023. Fifteen participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the institute conducted half day online training programme for construction industry on 'Importance of Occupational Safety and Health in Industry' on 23rd August, 2023. Thirty three participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the institute conducted half day online training programme for hazardous industry on 'Importance of Safety Committee in OSH' on 28th August, 2023. Nineteen participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the Institute conducted half day online training programme on 'Awareness Campaign for Construction Workers' on 6th September, 2023. Thirty three participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the Institute conducted half day online training programme on 'Occupational Safety and Health Awareness' for hazardous industrial workers on 11th September, 2023. Total forty seven participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the institute conducted half day online training programme 'Awareness of Occupational Safety and Health' on 18th

September, 2023. Seventeen participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the Institute conducted half day in plant training programme on 'Occupational Safety and Health Awareness' for hazardous industrial workers on 26th September, 2023. Total forty seven participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the institute conducted two half day online training programmes for hazardous industries on 'Basic Safety and Health Awareness at workplace' on 16th and 25th October, 2023. Total seventy three participants attended the programme,

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the institute conducted half day online training programme 'Awareness of Occupational Safety and Health' on 19th October 2023. Twenty two participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the Institute conducted half day online training programmes for creation of 'Occupational Safety and Health Awareness' for construction industrial workers on 26th October, 2023. The programme was attended by twenty seven workers.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the Institute conducted half day online training programmes for creation of 'Occupational Safety and Health Awareness for Hazardous Industry' for hazardous industrial workers on 3rd November, 2023. The programme was attended by twenty five workers.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the institute conducted two half day online training programmes on 'Awareness of Occupational Safety and Health' on 10th and 17th November, 2023. Total seventy participants attended the programme.

- To commemorate the 75th Anniversary of Indian Independence (Azadi Ka Amrit Mahotsav), the institute conducted half day online training programme for hazardous industry on 'Importance of Safety Committee in OSH' on 22nd November, 2023. Thirty five participants attended the programme.

Safety Audit at a Port in Tamil Nadu (Das, A.K. Mishra, Nag Mani and Rawat, R. S. Regional Labour Institute, Chennai)

The Safety audit was carried out at a Port in Tamil Nadu was in accordance with IS 14489:2018. The scope of this safety audit was to assess the safety, Health & Welfare of Dock workers employed in the Storage, handling& transportation of cargo. The audit was also aimed in relation to the safety of the equipment used in the process in relation to the existing standard and statutes along with Dock Workers (Safety, Health & Welfare) Regulations 1990.

The various audit elements covered are such as Safety management system in the Port, existing practices and procedures in cargo handling, procedures of accident reporting and investigation, Fire prevention plan, Canteens and other Welfare facilities.

It was recommended that Safety & Health Policy shall be reviewed periodically and commitment of management shall also be the part of the policy. Condition assessment test of the civil structures of Transit sheds, traffic & electrical offices & first aid centers at wharf needs to be assessed. Hazard identification and communication shall be made more effective. Vehicles entering at Port shall be checked thoroughly for its sound construction & condition. The transport drivers (having valid license) employed for transportation of cargo shall be medically examined and trained in Transport and material safety. Separate guidelines and cargo wise SOP shall be in place and usage of PPEs at the cargo handling areas shall be made more stringent.

Safety Audit at an Electrical Machines manufacturing Factory in Haryana (Roy, Sumit and Gola, A. Regional Labour Institute, Faridabad)

The safety audit was carried out at an Electrical Machines manufacturing Factory in Haryana. The plant was audited as per IS 14489: 2018.

Various areas like internal policies, company's standards and guidelines, facility's procedures and practices and compliance with legal requirements, and/ or accepted practices were audited as per statutory act, rules and standards.

Based on the observations and discussions, recommendations were given to the management of the factory for improving the safety, health and working condition in the factory. Plant was also recommended to carry out work environment study for improving the safety, health and working condition in the industry.

Safety Audit at Coal Handling Plant of Thermal Power Plant in Haryana (Dr. Sharma, K. and Gola, A. Regional Labour Institute, Faridabad)

The safety audit was carried out at the Coal handling plant of Thermal Power Plant, Haryana. The scope of this safety audit was to assess the safety and health of workers employed in the Coal Handling Plant (CHP) and safety of the CHP area and equipment used in the process as per the requirements of IS 14489: 2018.

Observations were noted on various management and technical elements of the plant as per IS 14489: 2018. Recommendations were given to the management regarding safety policy, safety management system, first aid box and its work environment. It was also recommended to carry out work noise, vibration and illumination study for improving the safety, health and working condition in the CHP.

Assessment of Breathing air Quality of Compressor air at a compressor manufacturing factory in Maharashtra (Satpute, P.G. Central Labour Institute, Mumbai)

The assessment of Breathing air Quality of compressor air carried out in Maharashtra was in accordance with as per IS 9623; 2008 Annex A Clause 8.1.2.2(a) of the Compressor Air. The objective of the study was to assess the concentration level of Carbon dioxide, carbon monoxide, oil mist and odour and to recommend necessary measures to control the concentration level of breathing air quality within prescribed limit.

The factory is engaged in manufacturing of compressor air for breathing air purpose and other PPEs for marine workers. The concentration level of carbon dioxide and carbon monoxide was measured by using IAQ monitor, ISI make, USA by direct reading method.

It was observed that the concentration level of compressor air viz carbon dioxide, carbon monoxide, oil mist and odour is well within their prescribed limits. Suitable recommendations were given in the report.

Ventilation Study at a chemical factory in Maharashtra (Vijaykrisha, G.P. and Satpute, P.G. Central Labour Institute, Mumbai)

The Ventilation study carried out at a chemical factory in Maharashtra was in accordance with Factories Act, 1948, Maharashtra Factory Rules,1963 and BIS standard IS:3103(code of Practice for Industrial Ventilation). The objective of the study was to identify the degree of ventilation level at different locations in the factory and to suggest the ways and means to improve the ventilation and thermal conditions.

The factory is engaged in manufacturing of different chemicals such as fatty acids, steric acid, Industrial mono-carboxylic acid etc, the samples have been collected from various selected locations. The equipment used during the collection of data was Sling Psychrometer, Globe thermometer and Kata thermometer.

It was noted that the general ventilation and thermal climatic conditions were meeting the standards but at few locations ventilation is low and RH is above limits. Suitable recommendations were given in the report such as the provision of exhaust fans, wall mounted air circulators etc.

Safety Audit at a Soap, Detergent and Scrubber manufacturing unit in Uttar Pradesh (Varadharajan, N, Dr.Sau, A. and Kasullah, M. Regional Labour Institute, Kanpur)

The scope of the safety audit was to assess the safety and health of workers by planning, conducting and documenting observations of audit(s) on occupational health and safety systems at work place. Safety audit was conducted for evaluating the effectiveness of health and safety programs, verifying the availability and implementation of elements of occupational health and safety systems and the system's ability to achieve defined safety objectives as per the guidelines given in the IS 14489:2018.

Suggestions were made to the management of the factory for improvement in the system's specified requirements like housekeeping by way of following 5S and for further more effective implementation of the specified requirements like training of fire fighters etc.

Safety Audit at Soap and Detergent Unit in ***Uttar Pradesh (Saxena, D.K, and*** *Varadharajan, N. Regional Labour Institute, Kanpur)*

The Safety Audit was conducted to assess the safety and health of workers as per as per the guidelines given in the IS 14489:2018.
The objectives were to carry out a systematic, critical appraisal of all potential hazards involving personnel, plant, services and operation method; and to ensure that OH & S system fully satisfies the legal requirements and those of the company's written safety policies, objectives and program.
Based on the observations and discussions, suggestions were made to the management of the factory for improvement in the system's specified requirements in the area of static electricity, transportation of chemicals, active and passive fire protection and also recommended for Work environment monitoring.

Safety Audit at a Packaging unit in Uttar Pradesh (Varadharajan, N. and Dwivedi, V.K. Regional Labour Institute, Kanpur)

The Safety Audit was conducted to assess the safety and health of workers as per the guidelines given in the IS 14489:2018. The audit goals were to assess the OH&S system in existence is complying the safety system standards as per the BIS and also to assess whether the relevant statutory and legal requirements are complied.

Recommendations were made to the management of the factory based on the observations and discussions for improvement in the system's specified requirements insisting for fire load calculation in the storage area, installation of fire detectors, fire alarms and also fire protection system in that area.

Safety Audit at a Sanitary Napkin unit in Uttar Pradesh (Varadharajan.N and Dwivedi, V.K. Regional Labour Institute, Kanpur)

The scope of this safety audit was to assess the safety and health of workers as per the guidelines given in the IS 14489:2018.The aim of the Safety Audit was to ensure that the OH&S standards are properly followed in the unit and necessary training is given to the workforce in the OS&H areas and to find out the non-conformities as against the IS 14489:2018.

Based on the observations and discussions, suggestions were made to the management of the factory for improvement in the system's specified

requirements; and for more effective implementation of the specified requirements of the system.

Workzone monitoring Study conducted at a Detergent manufacturing Industry in Uttar Pradesh (Acharekar, D.H, and Dwivedi, V.K. Regional Labour Institute, Kanpur)

The study was carried out to evaluate airborne concentration of total particulate matter and sulphuric acid in various plants of Detergent manufacturing Industry. It was found that airborne concentration of total particulate matter and sulphuric acid found well within its Permissible Limit of Exposure/ Threshold Limit Value except few locations such as feeder area.

The recommendations such as reasonably practicable engineering control measures such as enclosure at feeding point & use of Industrial vacuum cleaner etc. should be incorporated to control airborne concentration of total particulate matter, Hazard information in the form of MSDS of chemical used during manufacturing, should be displayed, MSDS of chemical used during manufacturing, should be displayed, Need based Health and Safety training shall be provided to the employees to make them aware towards Safe work such as health hazards of chemical, importance of housekeeping, proper use of PPE, care & maintenance of PPE etc. were suggested.

Safety Audit at a Packaging Unit, in Uttar Pradesh (Varadharajan, N. and Srivastava, K. Regional Labour Institute, Kanpur)

The scope of this safety audit was to assess the safety and health of workers Safety audit was conducted for evaluating the effectiveness of health and safety programs, verifying the availability and implementation of elements of occupational health and safety systems and the system's ability to achieve defined safety objectives as per as per the guidelines given in the IS 14489:2018.The audit was to provide the auditee to have a clear assessment of its own OH & S system as against the OH&S system standard and to identify areas for improvement to meet with the regulatory requirements.

Based on the observations and discussions, suggestions were made to the management of the factory for improvement in the system's specified requirements like stacking height at the raw material storage area, proper maintenance of lifting appliances, suggestions for manual material handling in the area of dyeing, strengthening of PPE usage etc.

Safety audit at a Port in West Bengal (Bhandari, H.M and Rao, G.G. Regional Labour Institute, Kolkata)

Safety Audit was carried out in the port of West Bengal. The safety audit has been conducted as per IS 14489:2018.
The objective of the Audit programme is to verify whether the organization's procedures and practices comply with legal requirements, internal policies, company's standards and guidelines, and/or accepted practices. It will tell the organization whether its procedures and practices are adequate and whether they are being followed. Based on the observations corrective actions were suggested to the organization in response to recognition of safety deficiency.

Safety audit at a Paper Mills in Odisha (Bhandari, H.M and Meena, H. Regional Labour Institute Kolkata)
Safety audit was carried out at a Paper mills in Odisha. It was aimed to highlight the strength and weakness of the system on both the Management and Technical aspects of Safety and Health Administration and impress upon the need for improvement on the Safety Standards. The Plant Management has promoted its Safety and Health Policy with wide publicity so that the plant employees understand the intention of the Management towards Safety and Health aspects. Paper Mills Management has already constituted Safety Committee and meetings are conducted to highlight safety issues and put control measures.
Recommendations were given such as permit for different operations needs to be followed strictly as per the system requirement. Maintenance of Occupational Health Centre, First Aid Boxes and Welfare facilities like canteen, drinking water, washing areas and toilet are to be given periodic attention for maintaining hygienic conditions.

Safety Audit at an Aluminium Company in Odisha (Tanoj, Chandan Bharate, M. and Rao, G.G. Regional Labour Institute, kolkata)

Safety Audit was carried out at an Aluminium Company in Odisha. The safety audit has been conducted as per IS 14489:2018.It was aimed to highlight the strength and weakness of the system on both the Management and Technical Aspects of Safety

and Health Administration and impress upon the need for improvement on the Safety Standards.

Based on the observations and discussions, suggestions were made to the management of the factory for improvement such as the Plant hospital needs to send details to the Safety Department about the absence of Workers due to disability. The Captive Power Plant is having a separate department with required infrastructural facilities to conduct the different training programmes. Refresher training and trainers training programmes for top functional heads on Safety and Health are to be conducted periodically. An effective regular Inspection and Maintenance are to be ensured. A good housekeeping standard is a must in the various areas in the Plant. Maintenance of Occupational Health Centre, First Aid Boxes and Welfare facilities like canteen, drinking water, washing areas and toilet are to be given periodic attention for maintaining hygienic conditions.

The HAZOP study at a Paper Mill in Odisha (RAO, G.G and Meena, H. Regional Labour Institute, Kolkata)

HAZOP study was conducted at a Paper Mill in Odisha .The main focus has been to recommend and improve the Safety system as applicable by the Safety Statutes, Codes, Standards and Norms.

The HAZOP study was carried out for all major equipment and/or each pipeline joining the equipment in a process through series of guide words around which a number of question are formulated to arrive at the possible deviations. In doing so, valve, instrumentation, nature of chemical process and unit operation involved are closely examined. The probable cause and the consequences of the deviation are listed and necessary corrective actions are suggested.

HAZOP study at an Aluminium Company (Chemical Division) in Jharkhand (Bhandari, H.M. and Meena, H. Regional Labour Institute, Kolkata)

HAZOP study was conducted at Aluminium Company (Chemical Division) in Jharkhand. The plant produces standard and special grades of alumina and alumina hydrate to serve customers in an aluminium, metal, refractory, glass and alum manufacturing industries. The plant incorporates Bayer's process for production of alumina from bauxite ore and a captive cogeneration power plant for power & steam. The plant is in two parts one is Red Area and other is White Area. The main objective of HAZOP study was to critically examine the Safety system in the plant and for recommendation and improvement of the Safety system as applicable by the Safety Statutes, Codes, Standards and Norms. Based on the observations and discussions recommendations were given to the management for improvement of the company.

The Statistical Cell, under Factory Advice Service (FAS) division, collects and compiles Occupational Safety and Health (OSH) statistics and other information, from Chief Inspector of Factories / Director of Industrial Safety and Health of State/UT governments, related to the administration of the Factories Act, 1948 and rules framed thereunder. This information base/database is used in planning and implementation of national policies concerning OSH as well as preparing replies to the various parliament questions and queries related to RTI. Apart from this, the Statistical Cell publishes and provides materials for various publications pertaining to the Occupational Safety and Health.

OSH Data of registered factories (2011-2019)

Year	No. of Registered Factories	Total Employ-ment	Dangerous Occurrences	Fatal Injuries	Non-fatal injuries	Total Injuries
2012	353684	14910645	1310	1317	28700	30017
2013	340226 (-3.81%)	14042410 (-5.82%)	1343 (2.52%)	1312 (-0.38%)	26852 (-6.44%)	28164 (-6.17%)
2014	361994 (6.4%)	20034859 (42.67%)	1534 (14.22%)	1266 (-3.51%)	25500 (-5.04%)	26766 (-4.96%)
2015	348429 (-3.75%)	16374546 (-18.27%)	1091 (-28.88%)	1107 (-12.56%)	20257 (-20.56%)	21364 (-20.18%)
2016	360949 (3.59%)	17376854 (6.12%)	700 (-35.84%)	1189 (7.41%)	5367 (-73.51%)	6556 (-69.31%)
2017	339931 (-5.82%)	16409493 (-5.57%)	1382 (97.43%)	1084 (-8.83%)	4866 (-9.33%)	5950 (-9.24%)
2018	364268 (7.16%)	18724733 (14.11%)	1124 (-18.67%)	1154 (6.46%)	4528 (-6.95%)	5682 (-4.50%)
2019	355478 (-2.41%)	18552909 (-0.92%)	1371 (21.98%)	1127 (-2.34%)	3927 (-13.27%)	5054 (-11.05%)
2020	363442 (2.24%)	20298387 (9.41%)	634 (-53.76%)	1050 (-6.83)	2832 (-27.88%)	3882 (-23.19%)
2021	321578 (-11.52%)	17414912 (-14.21%)	1058 (66.88%)	988 (-5.90%)	2803 (-1.02%)	3791 (-2.34%)

Year	Fatal injuries per lakh workers	Non-fatal injuries per lakh workers	Total injuries per lakh workers	Fatal injuries per thousand registered factories	Non-fatal injuries per thousand registered factories	Total injuries per thousand registered factories
2012	8.83	192.48	201.31	3.72	81.15	84.87
2013	9.34 (5.78%)	191.22 (-0.65%)	200.56 (-0.37%)	3.86 (3.56%)	78.92 (-2.74%)	82.78 (-2.46%)
2014	6.32 (-32.33%)	127.28 (-33.44%)	133.60 (-33.39%)	3.50 (-9.33%)	70.44 (-10.75%)	73.94 (-10.68%)
2015	6.76 (6.96%)	123.71 (-2.8%)	130.47 (-2.34%)	3.18 (-9.14%)	58.14 (-17.47%)	61.32 (-17.07%)
2016	6.84 (1.18%)	30.89 (-75.03%)	37.73 (-71.08%)	3.29 (3.46%)	14.87 (-74.42%)	18.16 (-70.38%)
2017	6.61 (-3.36%)	29.65 (-4.01%)	36.26 (-3.90%)	3.19 (-3.04%)	14.31 (-3.76%)	17.50 (-3.63%)
2018	6.16 (-6.81%)	24.18 (-18.45%)	30.34 (-16.33%)	3.17 (-0.63%)	12.43 (-13.13%)	15.60 (-10.86%)
2019	6.07 (-1.46%)	21.17 (-12.44%)	27.24 (-10.22%)	3.17 (0.00%)	11.05 (-11.10%)	14.22 (-8.85%)
2020	5.17 (-14.83%)	13.95 (-34.10%)	19.12 (-29.81%)	2.89 (-8.83%)	7.79 (-29.50)	10.68 (-24.89%)
2021	5.67 (9.73%)	16.09 (15.38%)	21.76 (13.85%)	3.07 (6.31%)	8.71 (11.89%)	11.78 (10.38%)

Data Source: Data collected by DGFASLI through correspondence with Chief Inspector of Factories (CIF) of States/UTs.

***N.B**.:(i) Figures in the bracket indicate percentage change as compared to the previous year.*
(ii) The data in the table pertaining to the following years doesn't include data from the States/UTs mentioned against them as these states did not provide data to DGFASLI during that year: 2021 - Daman and Diu & Dadra and Nagar Haveli, Punjab, Uttar Pradesh and West Bengal, 2020 - West Bengal, 2019 - West Bengal, 2017 - West Bengal, 2013 - Jammu & Kashmir and Uttar Pradesh, 2012 - Uttar Pradesh, 2011 - Uttarakhand and Uttar Pradesh.

The above table shows Occupational Safety and Health data of last 10 years (2012-2021) of factories registered under Factories Act, 1948.

The following observations can be made from the data:

- The no. of registered factories and total employment in registered factories registered shows a general increasing trend during the last ten years. During the years 2012-2021, the no. of registered factories in India decreased by 9.08% from 3,53,684 to 3,21,578 while the total no. of workers employed registered an increase of 16.79% from 1,49,10,645 to 1,74,14,912.

- Both the fatal and non-fatal injuries registered a decline as compared to the base year 2012. There is decline of 24.98% in the no. of fatal injuries in the registered factories since 2012 to 2021 i.e. fatal injuries in registered factories decreased from 1317 to 988.The largest annual decline of 12.56% is seen in fatal injuries during the year 2015.While during the year 2016 non-fatal injuries registered the largest ever annual decline of 73.51%.

- During the corresponding period, the non-fatal injuries in the registered factories decreased by 90.23% from 28,700 to 2,803. The largest annual decline of 73.51% is seen in non-fatal injuries during the year 2016 i.e from 20257 to 5367.

- There is a consistent decline every year in the no. of total injuries. Each year, the no. of total injuries reported is less than the previous year. It can be observed from the table that the decline in the no. of total injuries during the year 2016 is steeper vis-à-vis during the years preceding 2016. There is massive decline in the non-fatal injuries and thus, total injuries after the year 2015. During the year 2016 and 2018, the state of West Bengal reported a large decrease in the no. of non-fatal injuries as compared to previous years, while it didn't report data of the year 2017, 2019, 2020 and 2021.

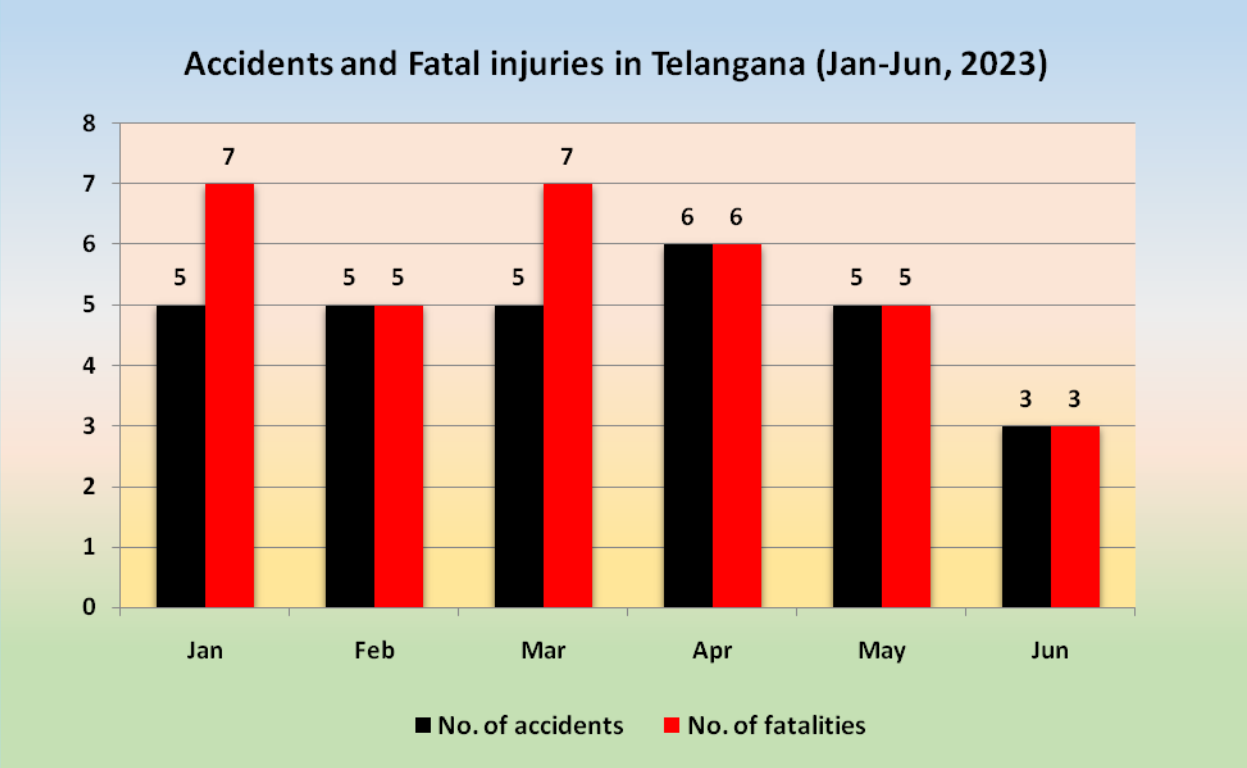
- The no. of fatal injuries and non-fatal injuries per lakh workers in the registered factories have witnessed a general declining trend since the year 2012 except for the year 2021. It can be noted that the non-fatal injuries per thousand registered factories and total injuries per thousand registered factories have shown a consistent declining trend since 2012 and each year the incidence rate is lower than the previous year except for the year 2021.

- The no. of fatal injuries per lakh workers reduced from 8.83 to 5.67 during the last 10 years; while during the corresponding period, the no. of non-fatal injuries per lakh workers reduced from 192.48 to 16.09. During the same period, total injuries (both fatal and non-fatal) per lakh workers reduced from 201.31 to 21.76.

- The no. of fatal, non-fatal and total injuries per thousand registered factories, show a general declining trend during the period 2012-2021.

Trend Analysis: Accidents, Fatal and Non-fatal injuries reported in the factories registered under the Factories Act, 1948 in Telangana (Jan - Jun, 2023)

Month	No. of accidents	No. of fatalities
Jan-2023	5	7
Feb-2023	5	5
Mar-2023	5	7
Apr-2023	6	6
May-2023	5	5
Jun-2023	3	3
Total	**29**	**33**



The above table shows the no. of fatal accidents and fatalities reported in the factories registered under the Factories Act, 1948 in Telangana State during Jan-June, 2023.

It can be observed that during Jan-June 2023, 29 accidents and 33 fatalities occurred in Telangana State. The largest numbers of cases of accidents i.e. 6 were reported in the month of April and the largest numbers of fatalities i.e. 7 were reported in the month of January and March. Also, the number of accidents ranges from 3 in June to 6 in April; while the number of fatalities ranges from 3 in June to 7 in January and March.

The average number of accidents per month is approximately 4.83, while the average number of fatal injuries per month is approximately 5.5.

The number of fatal injuries does not always correspond to the number of accidents. For example, in Jan, there were 5 accidents but 7 fatal injuries, whereas in Apr, there were 6 accidents and 6 fatalities.

Applying chi-square test on the above data, we get chi square value as 0.41, 5 degrees of freedom and p value as 0.988 while the critical chi square value is 11.07 and chosen significance level is 5%. This suggests that, based on the provided data, the frequencies of accidents and fatalities are not significantly different, and any apparent patterns may be due to random variation. Thus, it can be said that there is not enough evidence to claim a significant statistical association between the number of accidents and the number of fatalities in the state of Telangana.

There is no clear linear trend in the number of accidents or fatal injuries throughout the year. However, there seems to be a slight increase in the number of fatal injuries from April to June as compared to January to March.

The Dock Workers (Safety, Health and Welfare) Act, 1986 and the Regulations 1990 framed there-under cover safety, health and welfare aspects of all the workers engaged in dock work within the port premises. These statutes are in line with the ILO Convention No. 152 on Occupational Safety and Health (Dock Work).

The DGFASLI through the Inspectorates of Dock Safety set up in all the major ports in India, enforces the Dock Workers (Safety, Health and Welfare) Act, 1986 and the Regulations, 1990 and strives to ensure Safety, Health and Welfare of dock workers. The Chief Inspector of Dock Safety is also an authority for enforcement of the Manufacture, Storage and Import of Hazardous chemicals Rules, 1989 framed under the Environment (Protection) Act, 1986 in the major ports.

The above statutes are enforced by the Inspectors posted at Inspectorate Dock Safety at all the major ports viz. Mumbai, Kolkata, Chennai, Kandla, Mormugao, New Manglore, Cochin, Tuticorin, Visakhapatnam, Paradip and Jawaharlal Nehru Port except Ennore where the Inspectorate is being set up. Presently, the enforcement in this Port is carried out by the Inspectors posted in Inspectorate Dock Safety, Chennai.

The main function of Inspectorates is to ensure the compliance with the provisions under the statutes. The statutory responsibilities of Inspectors include inspection of ships, tankers, loose-gears, container-handling equipment, docks container-yard and terminal, prosecution of employers, attending to complaints, providing advisory services. The Inspectorate also prosecutes the agency responsible for serious violation of provision of the Act and Regulations framed there-under.

Activities carried out from January, 2023 to December, 2023

Activity	Total
Total number of Ship Inspected	321
Total number of Gear Inspected	292
Total number of Dock/Shed/Yard/ Warehouse/Go-down/storage yard, etc. Inspected	420
Total number of other visits carried out	490
Total number of Hazardous Installations Inspected	8
Total number of reportable Fatal Accidents as per dock safety statutes	26
Total number of reportable Non-Fatal Accidents as per dock safety statutes	02
Total number of reportable Accidents as per dock safety statutes	28

Case Study No. 1

Styrene Gas Leak from M/S LG Polymers Plant (Visakhapatnam)

Abstract

Styrene gas leak from the M/S LG Polymers India Pvt Ltd plant on 7th May 2020 in Visakhapatnam (Andhra Pradesh), which was operating without environment clearance for over two decades, Killed 12 people and sickened hundreds. This case study showed how gross human negligence and violation of rules and the law led to the deadly disaster. The death toll could have been much higher if an alert resident had not woken up to see a thick cloud of gas enveloping house in the area. Word about gas leak spread like wildfire and hundreds of resident of the villages poured out from their homes and start to run away for saving their lives.

Preliminary investigations concluded that the accident was likely the result of improper maintenance of units storing the styrene monomer, improper storage and operation errors. The South Korean parent company, LG Chem, said in its May 2019 affidavit, a part of an application for environment clearance, that the company did not have a legitimate environmental clearance issued by the Ministry of Environment, Forest and Climate Change (MoEFCC), after receiving an Environmental impact assessment (EIA), substantiating the produced quantity and for continuing operations. According to the EIA notification (amendment) of 2006 under the Environment Protection Act of 1986, LG Chemicals India, which is part of the petrochemical industry, falls into the category 'A' and should get clearance from the MoEFCC every time they expanded their plant or brought a change to their manufactured product after November 2006. LG Chem expanded its operations at LG Polymers plant five times between 2006 and 2018 without such clearance.

Smoke is seen at LG Polymers plant in Visakhapatnam, May 7, 2020. Courtesy- The Hindu

History of the plant

The M/S LG Polymers India Pvt Ltd plant owned by the LG Chemicals a South Korean firm. Initially it was started by the Mumbai based Sriram group in 1961.That time its name was “Hindustan Polymers” and its function is to make polystyrene and its Co-polymers. It manufactures expandable polystyrene using styrene, Pentane and HCL as raw materials. Polystyrene, this is used to make the parts of appliance, electronics and automotives. Some it also used for food packaging.

In 1978, plant was purchased by McDowell and Company limited of the UB (United Breweries) group, owned by Vittal Mallya and Vijay Mallya. The UB group stopped the manufacturing styrene gas when they realized that it less expensive if import from countries such as Singapore and Saudi Arabia.

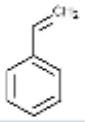
Afterward In July 1997, LG Chem (South Korea) purchased the plant from UB Group. The industry has strength of 475 including 200 contract workers. It dismantled the old styrene plant and began storing imported styrene in a few tanks, one of which malfunctioned on the night of May 7.There are 2 tank for storing styrene gas having capacity 2791.8 Tons and 3825 Tons. On the night of incident 1830 Tons stored in one tank(which malfunctioned) and other tank

stored 2725.9 Tons. Apart from this, the industry has also taken two tanks of 5500 KL and 7300 KL capacities in the premises of m/s east India Corporation at sheela Nagar, Visakhapatnam and around 10000 KL Stored.

Properties of styrene (C_8H_8)

Styrene is a colorless and clear liquid. It has sweet smell and can found in nature as well as manufactured. Styrene originally found in the oriental sweet gum tree (Levantstyrax).It can also be found in food and beverages such as strawberry, Coffee, cinnamon and peanuts. Manufactured Styrene has many usages and is a component of many goods, including polystyrene, fiber glass, packing materials, electrical insulation and home insulation etc. Styrene is volatile and highly flammable compound. Styrene *vapor* is heavier than Air. At concentration normally encountered at workplace, the air and styrene mixture is not significantly heavier than clean Air. It evaporates rapidly at higher temperature and can smell at very low temperature. Prolonged exposure can reduce the ability to smell it. It is soluble in body fat and can be absorbed through skin also. Moreover studies reveal that if it is present in polyester resin then not easily absorbed through Skin. Inhalation is major route of exposure. It is a group of 2A carcinogen as per IARC monograph.

Styrene: Chemical Identity & Physical Properties

General Information	
Chemical name	Styrene
Synonyms	Cinnamene, ethenylbenzene, phenylethylene, styrol, vinylbenzene
Chemical formula	C_8H_8
Chemical structure	
Molecular weight	104.15
Color	Colorless to yellow
Odor	Sweet, aromatic (if pure) Sharp, penetrating, unpleasant (commercial grades)
Physical state	Oily liquid
Identification numbers	CAS Registry: 100-42-5 EINICS: 202-851-5 DOT/UN/NA/IMDG shipping: IMDG 3.3; UN 2055

Physical Properties	
Characteristic	Property
Melting point/freezing point	-30.6 °C (-23.1 °F),
Boiling point	145.2 °C (293.4 °F),
Density at 20 °C	0.9059
Odor threshold Water Air	 0.73 mg/L 0.1 ppm (0.43 mg/m^3)
Solubility Water at 20 °C Organic solvents	 300 mg/L (0.03% wt.vol.) Soluble in alcohol, ether, acetone, carbon disulfide
Partition coefficients Log K_{ow} Log K_{oc}	 2.95 2.96
Vapor density (air = 1)	3.6
Vapor pressure at 20 °C	5 mmHG (5 mbar)
Henry's law constant (at 25 °C)	261x10^{-3} atm-m^3/mol (calculated)
Autoignition temperature	490 °C (914 °F)
Explosive limits in air	0.9-6.8% vol.
Flashpoint	31 °C (87 °F), closed cup 34.4 °C (93.9 °F), Tag open cup
Flammability limits	0.9-1.1 (lower); 6.1-6.8 (higher)
Conversion factors	1 mg/m^3=0.23 ppm 1 ppm=4.33 mg/m^3

Adapted from ATSDR toxicological profile for Styrene and the website of the European Styrene Producers Association

Effect of Styrene to humans and Animals

Styrene is the 20th most-used chemical in the world, according to the World Health Organization. The chemical can be found in air, water and soil once released into the environment. It is broken down by micro-organisms if it reaches soil.

It can enter the human body through breathing, eating food and contact through skin. Once it enters the human body, styrene takes a few days to break down into other chemicals and pass through urine. It is the most harmful in its most basic form as a monomer (a single unit of styrene), according to the Agency for Toxic Substances and Disease Registry (ATSDR) of the Centers for Disease Control and Prevention, the United States.

When humans are exposed to styrene, it causes eye irritation and gastro-intestinal effects. It also impacts the outer layer of tissues in the skin causing erosion and bleeding in the short term. Long-term effects include central nervous system dysfunction, depression, hearing loss and peripheral neuropathy (a numb feeling in the hands and feet). It also leads to an increase in the color confusion index that may lead to color blindness.

Animal studies show they are more sensitive to styrene exposure and suffer greater effects. “The styrene concentrations that cause these effects are more than a thousand times higher than the levels normally found in the environment,” ATSDR pointed out.

This means the gas leak that occurred in Visakhapatnam is a major one. The International Agency for Research on Cancer (IARC) has determined that styrene is a possible carcinogen and can cause cancer under long exposure.

Several epidemiological studies suggest there may be an association between styrene exposure and an increased risk of leukaemia and lymphoma, according to the US' Environment Protection Agency (EPA). The EPA also suggested that "human studies are inconclusive on the reproductive and developmental effects of styrene".

Dead cattle affected by a gas leak at the LG Polymers Plant is pictured in Visakhapatnam, India, May 7, 2020. Courtesy- CBS News

The Factories Act , 1948

The Factories Act, 1948, was amended in 1987 to insert a Separate Chapter IV-A (Provisions dealing with hazardous processes) in the wake of the Bhopal gas tragedy. On the night of December 2-3, 1984, methyl isocyanate (MIC) gas leaked from the Union Carbide India Ltd pesticide plant in Bhopal, which killed thousands of people and injured more than half a million.

In The Factories Act, 1948, under Section 41F, styrene is included in the Second Schedule, which deals with "permissible levels of certain chemical substance in work environment" (Item 102).

S. No	Substance	Permissible Limits of Exposure			
		Time-weighted average Concentration(TWA) (8hrs)		Short-term exposure limit STEL (15min)	
		ppm	mg/m^3	ppm	mg/m^3
102	Styrene, monomer (Phenyl-ethylene)	50	215	100	425

Adapted from The Second Schedule, The Factories Act 1948

CAUSE OF FAILURE

The Plant has been closed since 24 March 2020 due to the COVID – 19 Lockdown. On the day of lockdown, Styrene gas stored in 4 tanks with inventory of 1830 Tons, 2725.9 tons, 242.6 tons and 242.5 tons. However the plants permitted the maintenance staff for carrying out necessary maintenance with 15 Persons each shift.
Govt of AP announced the resumption of operation of industries from 04 May 2020 and LG polymers management proposed to resume operation from 07th May 2020.On the early hour of 07th May, the1830 Tons Storage tanks developed leak of styrene vapor and spread the beyond boundary towards west side due to wind direction and effected nearby five Areas.
The leaked tank was old and don't have facility to measure temperature at middle and top part of the tank. There is only provision to measure temperature at bottom portion where refrigeration is provided. The storage tank was stand still due to Lockdown. The styrene polymerizes to polystyrene even at ambient temperature, in the absence of inhibitor, which itself an exothermic reaction with very slow reaction rate. Despite of slow reaction, it causes major operating issue because of heat liberation and blockage in tanks. The rate is double at every 10 Degree Celsius. The combination of polymerization- Heat liberation- temp Increase and further polymerization can lead to rapid reaction and Heating which is called as a "Run-away reaction". As the temp rises, styrene gas start the vaporization and subsequently pressure in the tank will increase and safety valve release the gas into atmosphere. The parameter not observed by the industry.
Styrene monomer with a boiling point of 145 Degree Celsius, in liquid state remain monomer if it is maintained at low temp preferably 15- 18 Degree Celsius , if the temp approached 20 Degree Celsius the tank must be cooled and under no circumstances the temp should exceed 25 degree Celsius. If its temp is increased, self polymerization start slowly, which is an exothermic reaction, thereby liberating heat, which further increase the rate of polymerization and chain reaction begins. This lead to exponential increase in polymerization.

The monomer styrene is stored without letting self – polymerization by adding inhibitor substance like Teritiary Butyl Catechol (TBC). This inhibitor works at low temp below 25 Degree Celsius. TBC is not effective as inhibitor of monomer styrene at High temp. Another chemical named *n-dodecyl mercaptans (DDM) is* used as inhibitor at high temperature. Since the styrene gas in close container, rises in temp increase the tank pressure. To avoid structure failure of tank, Safety valve installed which get open at high pressure and release the gas thereby reducing the pressure. Five valves provided at Top of affected tank roof. During the stagnant storage period, apparently the monomer styrene started self polymerization leading to increase in temperature as the process is exothermic. The increased temp further increased the rate of reaction resulting in increased pressure in the tank. Safety valve on the tank roof top got opened due to high pressure and started emitting styrene vapors. As per CCTV record, the emission started at about 02:42 a.m. from tank having 1830 tones of styrene. No alarm generated when vapor leakage occurred and auto sensor of styrene is failed to detect the concentration in ppm(Parts per Million).

There are no interlock system arrangements between the temp and refrigeration system. There is no external water spray arrangement over the storage tank for exceeding ambient air temp and also any unmanned hose arrangement.
It should be noted that in climate zones and in Seasons with significant temperature difference between night and day, the styrene vapours evolved in the headspace at Higher temperature will condense on roofs, walls and internal fittings of storage tanks when it cools off. The phenolic inhibitors have high boiling points and stay in the liquid phase, resulting in the condensed styrene vapors containing no inhibitor. Also, the condensation will result due to long term storage of styrene monomer during 'zero process operation' without maintaining required cooling throughout the tank. The leaked tank does not have any provision for measuring the vapor space temperature. Due to this, building-up of temperature in top surface could not notice by the industry, this reflects the clear cut case of negligence on Industry part.

The Incident is tragic but it could have been far worse had the affected tank. Tank M 6 ruptured and the temperature of the tank contents at shot up far beyond 154 degree Celsius, well over the boiling point of styrene. An estimated 800 tons of styrene escaped into the surroundings in the incident, it is reported that unit's inability to access personal protective equipment in a timely manner, safety response preparedness of the site had impact in the early stages of safety operations. Further, the public siren system also could not be activated as it was manual and in the area

rendered inaccessible by the vapor cloud else people in surrounding areas could have been alerted quickly and lives saved.

Root cause analysis Showed that the problem possibly begin on April 20, 2020 when the polymer concentration in Tank M6,which was Idled at full capacity since March 25 post-lockdown. it is known that styrene monomer can exhibit reaction runaways because of their exothermic and auto- accelerating nature even at a adiabatic conditions. The polymerization Runway 'onset' temperature inversely increased with the monomer mass fraction and generally observed to 66 degree Celsius. Styrene polymerization reaction is relatively highly exothermic with heat generation at around 71 kJ per mole. At the same time, even without an initiator, two styrene molecules can undergo a Diels-Alder type of reaction and generate radicals to start self polymerization upon heating. The polymerization reaction being exothermic, if contained may become uncontrolled and the bulk styrene temperature may rise to a level at which polymerization is self sustaining and Very Rapid. This results in evolving the release of large quantities of heat together with volumetric expansion and set off an undetected, slow but steady formation and growth of a hotspot within the tank where an exothermic (Heat-generating) reaction of polymerization started. By early morning of May 7, the hotspot probably reached Critical Mass .somewhere between 1:45 a.m. and 2:40 a.m. this led to a Runaway reaction and the temperature shot up in the tank. However, the only two parameters being monitored in the tank- the temperature and the tank level were being measured through gauges at the bottom of the large tank(18 m in diameter and 12 m in height) presumably far from the hotspot, and these picked up the problem after it occurred at 2:40 am. the first sign that anything was amiss was picked up the control room operator through a vapor release alert at 2:54 am, and the temperature alert only came 8 minute later. Mitigation of the impact could have been more effective had the chiller servicing tank M6 been running. It was switched off at 5:00 pm earlier that evening as per routine side practices as ambient night temperature required little or no chilling. There was also no automated sprinkler arrangement for vapor loss as this had never been anticipated, the fire water sprinklers had to be manually activated. Another reason for the accident, TBC (inhibitor of the polymerization reaction) is not effective after liquid styrene temperature in storage rises above 52 degree Celsius. Under this condition, a short-stopper chemical should be added. It seems LG Chem did not consider the possibility. Also no TBC was topped up in the affected tank M6 since April 1, since there was no stock at site and tested TBC level of the contents was apparently in range. Clearly it can be realized that the TBC level is not a good indicator of safety margins. The polymer content is a better measure for an early alert. With the experience world over the styrene, it takes considerable amount of idle time to have polymerization inside tank if effective inhibition and chilling is maintained. The unit failed to assess this situation due lack in handling experience by trained man power.

The root cause thus appears to be the lack of experience of LG polymers India and their Korean principal. LG Chem, in monitoring and maintaining full tank of styrene that were idled for a long period of several weeks without operation. Further M6 is an old tank in design terms and this possibly contributed to the problem. The breather vent through which the boiling styrene escaped was 8 inches in diameter, enabling very significant outflow at the high temperature and pressure generated by the runaway reaction. Operators and any industrial persons are not aware of control measures in such situation is the main cause.
The above scenarios definitely point towards the accountability for lapses on part of the Industry, Which rest with Managing Director of the unit, certified Safety officer, Safety Department, and Production department. The role of issuing necessary safety certificate to the industry, the periodic inspections is the primary responsibility of Department of Industries, factories and Boilers.

According to report of joint monitoring committee constitute by the national green Tribunal, reason for the styrene gas/vapor leakage from the affected tank due to-

1) Insufficient tertiary Butyl catechol (TBC, used as inhibitor to avoid polymerization at lower temp) concentration in styrene tank due to unavailability of TBC in the plant.
2) There is no monitoring system for dissolved oxygen in the vapor space which might have fallen down below 6%.
3) The tank has no provision of monitoring temp at top layer of the storage
4) Refrigeration system was not being operated for 24 hours.

5) Gross human failure and negligence of the person In charge of the plant and maintenance personnel of storage tanks.

SUGGESTION FOR RESTORATION

1) The affected tank poses no further risk but the polymerized mass has to be taken out and disposed at TSDF preferably incinerated. Alternated arrangements for converting to useful product may be explored after consultation with expert in the field so that incinerated effect can be lowered.
2) Suggested to have all styrene inventories in the storage tanks of 'LGPI, including two Out sourced shore tanks, having no chilling facility.
3) The unit shall he directed to empty all storage tanks with other chemicals, waste- residues, hazardous wastes, spill-material, intermediates, by-products and final product. The unit must share the material safety data sheets of the hazardous chemicals handled by it to concerned departments.

REMEDIAL MEASURE TO PREVENT RECURRENCE

1) Hazard identification and evaluation in a local community. Preparation of Guiding Principles for Accident Prevention, Preparedness and Response for onsite and offsite emergency plans to he reviewed.

2) A detailed study of the risk assessment and disaster management studies to be carried out by the industry.

3) The styrene metabolites are of genotoxic and can cause carcinogenic health impacts to the population exposed based on different factors. It is suggested that the industry shall prepare a comprehensive health monitoring programme along with reputed hospitals for the suspected population at least for five years. Based on the data and health results of the study the monitoring may further continued The District Administration shall monitor the whole programme for its proper implementation.

4) Preparation of a comprehensive EIA report in accordance with the MoEF& CC guidelines.

5) Safety audit to be conducted by certified third party regularly for onshore facilities under Manufacture, Storage and Import of Hazardous Chemical Rules,(MSIHC Rules) for styrene import.

6) The distancing criteria for Storage tank of styrene has to be followed as per schedule 1 of MSIHC Rules. 1989.

7) Installation of the automatic siren when any parameter goes out of control The siren needs to be done within and outside the industry show that the villages around are alarmed about the same.

8) Emergency ambulance services to be arranged in the industry premises along with an experienced doctor.

9) Awareness campaigns in the villages around the industry to make them aware of the measures to be taken in case of any accident/ damage from the industry to the area around the industry.

10) Ready made PPEs to be placed at the emergency points in case of any accident.

11) Separate safety manual to be prepared for each equipment along with the accidental management plan.

12) Periodic inspection by Department of Factories & Safety to assess the safety measures and documents maintained by the industry. If tailed, necessary action shall be initiated against the industry.

13) API RP 575 protocol should be followed for inspection.

14) Design of storage tank should fulfil MoEF&CC notification dated 09/11/2012 with vapour control system.

15) Automatic styrene sensor should be installed in the different direction and residential with minimum detection limit of 1 ppm.

16) Carbon steel and stainless steel are suitable for handling styrene and Blanketing of tanks for fire protection should be considered.

17) The tank must have the capacity to contain the styrene product as well as enough volume for adding diluents to quench the reaction.

18) The administrative failures such as not obtaining Environmental Clearance from MoEF&CC. not implementing the recommendations of APPCB and factories of inspectors in time (based on inspection reports), failure of replacing the old storage tanks and having no safety measures for temperature recordings, no safety audit reports are to be further investigated.

19) The role of factories and inspectors to be specified and their inspection protocol are to be assessed Pan-India. Since safety aspects are part of their mandate an independent audit is required in the light of many accidents reported due to failure of safety measures and lack of training.

20) In order to prevent such accidents, a District Crisis Group (DCG) needs to be established under the chairmanship of District Collector. This group has to meet every 45 days to review the safety and hazard issues of each and every industry Similarly, State Crisis Group (SCG) needs to be established under Chief Secretary this committee should meet every 3 months and review the onsite/offsite District emergency plan prepared by DCG and suggest the measures to be taken to minimize the accidents. Both DCG and SCG should make plans to create awareness among the people living in the surrounding area of the industry about chemical hazards and measures to be taken for accidents.

21) It is suggested that each State shall take responsibility in implementing the Chemical Disasters Management, protocol (March 2009 publication) and MH1DC remedial measures and submit Action taken Report.

22) Responsibility Matrices for Disaster Risk Mitigation as per National Disaster Management Plan (May 2016) has to be taken up and assess the implementation schedule by cacti States and UT's.

SCOPE OF FURTHER STUDIES

Suggested scopes of further studies are -

1) Monitoring of environment parameters viz air, ground water, surface water, soil for the nest 12-14 months to access the long term effect of styrene gas.
2) Vapors cloud dispersion studies.
3) Assessment of the environmental components for styrene concentration.
4) Remedial measure for contaminated soil and water
5) Risk assessment studies for the accident
6) Prediction of the effect of the accident over long term and short term through modeling studies.

References

1) *"Visakhapatnam gas leak live update" The Hindu. 7 May 2020*. Retrieved 7 May 2020.
2) *"Indian LG plant lacked environmental clearance before leak" The Associated Press (AP).* U.S. News & World Report*. 13 May 2020*. Retrieved 14 May 2020.
3) " Company History" LG Polymer India
4) "Vizag gas leak: How styrene effect human, animals", Down to Earth by Akshit Sangomla. 07 May 2020. Retrieved 16 June 2020.
5) Ground Zero Article , The Hindu 06 June 2020 by Sumit bhattacharjee

6) Report of the joint monitoring committee constituted by the National Green Tribunal (NGT), PB, New Delhi, dated 28 May 2020

Case Study No. 2

The employee was an experienced welder who had worked a year and a half for this employer. He was assigned by his supervisor to weld a 11/2-inch-long crack in an empty diesel fuel tank. The fuel tank had been removed that morning from a diesel truck.

The welder did not personally inspect the tank for diesel fuel or fumes before beginning his work. At 7:30 a.m., the welder began to weld with an arc welder unit. The tank exploded at the seam line away from the welder. The welder suffered serious fractures of his jaw, right wrist, and left hand, along with other injuries. The welder was hospitalized for 4 days.

WHY THIS ACCIDENT HAPPENED

1) The primary cause of the accident was that the fuel tank was not cleaned before the welder struck an arc on the tank. Although the tank was empty, it still contained diesel vapors at a high enough concentration to cause an explosion.

2) This may have been a rush job, because the fuel tank was removed that morning, and by 7:30 a.m., the welder was beginning to weld on it. This did not allow enough time to properly clear the tank of diesel liquids and diesel-saturated air. Maybe the welder felt the need to get the job done right away and decided to cut a safety corner by not cleaning the tank.

3) The supervisor who assigned the job of welding the diesel tank may not have communicated the fact that the tank needed to be cleaned first. He may have assumed that the welder would know to clean the tank first. He may have assumed that whoever removed the tank from the truck had cleaned the tank. Unclear communication and unfounded assumptions are at the root of many serious accidents.

4) The welder may have assumed that the tank was cleaned first. However, a quick inspection of the tank would have revealed that it was not cleaned when it still smelled like diesel fuel.

5) Although the accident investigation does not specify, the welder may not have known that the tank should have been cleaned first. Even though he is an experienced welder, he may have never welded a fuel tank before. He may not have been trained properly on the dangers of welding fuel tanks or on how to properly clean and flush out a fuel tank

PREVENTING THESE ACCIDENTS

Train welders to follow proper procedures for jobs that might have special risks. For example:

- **Clean and flush fuel tanks to remove all residual fuel! liquids.** Remember, flushing the tank with *a* solvent will \ only replace the fuel with a combustible solvent that also has very flammable vapors. Clean the tank with a water- I based solution. Remember to manage the fuel contaminated cleaning solution appropriately. Do not put it down the sink.

- **Open up the tank and allow it to "breathe" for a while in** order to remove the fuel-saturated air that is contained in the tank. To expedite this process, a fan can be used to help flush the fuel-saturated air out of the tank. Be sure to wear the appropriate protective equipment, such as a respirator, if one is required.

- **Inspect the work and the work area before starting any job.** This welder could have avoided the accident if he had done a quick inspection of the tank. He would have discovered that the tank smelled like diesel. In

addition to the job, inspect the work area for any combustible or flammable objects. If necessary, complete a Hot Work Permit before starting to weld.

- **Make sure you are properly trained on the requirements of the job.** Learn about the hazards of the job, and follow all company safe work practices.
- **Never make any assumptions about the work you have; been assigned.** Communication is critical for making the workplace safe. If you have any questions, ask your' supervisor.

RECOMMENDATIONS

Here are the 7 recommendations, investigators made after Studying these hot work accidents.
1. Use alternatives. Whenever possible, avoid hot work and consider alternative methods.

2. Analyze the hazards. Before starting hot work, perform; a hazard assessment that identifies the scope of the work, potential hazards, and methods of controlling those hazards.

3. Monitor the atmosphere. Conduct effective gas monitoring in the work area using a properly calibrated combustible gas detector before and during hot work activities, even in areas where a flammable atmosphere is not anticipated.
4. Test the area. In work areas where flammables are stored or handled, drain and/or purge all equipment and piping before performing hot work. When welding on or in the vicinity of tanks and containers, properly test and, if necessary, continuously monitor all surrounding tanks or adjacent spaces for the presence of flammables and eliminate potential sources of flammables.

5. **Use written permits.** Ensure that qualified personnel familiar with the specific site hazards review and authorize all hot work and issue permits specifically identifying work to be conducted along with required precautions.

6. **Train thoroughly.** Train personnel on hot work policies and procedures, proper use and calibration of combustible gas detectors, safety equipment, and job-specific hazards and controls. This should be done in a language understood by the workforce.

7. Supervise contractors. Provide safety supervision for outside contractors conducting hot work. Inform contractors about site-specific hazards, including the presence of flammable materials.

Case Study No. 3

Analysis of Fatal Accident Involving Lorry and Motorcycle at Port: Causes and Preventive Measures"

Scenario:
An empty lorry, typically used to transport metallurgical coke from the coal storage yard of the port, was moving directly towards the weighbridge at a permissible speed for weighing. Simultaneously, a motorcycle ridden by a supervisor was heading towards the docks and passed the lorry from its left side in order to execute a sharp right turn. Unfortunately, the motorcycle collided with the lorry, resulting into the fatal accident of the supervisor. The motorcycle also sustained significant damage.

Direct Causes & Remedial Measures :

1. Lack of clear demarcation or designated lanes for different types of vehicles, leading to confusion and risky overtaking manoeuvres.
2. Inadequate signage or communication regarding the designated route for motorcycles and other vehicles within the port area.
3. Insufficient training or awareness among drivers and supervisors regarding safe driving practices, particularly when navigating around larger vehicles like lorries.

4. Poor visibility or blind spots around the lorry, making it difficult for the motorcycle rider to gauge the appropriate timing for overtaking.
5. Failure to adhere to speed limits or traffic regulations by either the lorry driver or the motorcycle rider.
6. Potential distractions or inattention on the part of either the lorry driver or the motorcycle rider, increasing the likelihood of a collision.
7. Lack of proper maintenance or inspection of vehicles, which could contribute to mechanical failures or decreased maneuverability in critical situations.

Conclusion:

Addressing these potential causes through improved infrastructure, enhanced training programs, better signage, and stricter adherence to safety protocols can help mitigate the risk of similar accidents in the ports.

Case Study No.4

Unsafe Handling of Cargo in Port Operations"

Scenario- Cargo handling was underway in the warehouse for break bulk cargo. The remaining cargo was placed in a sling, and the sling's ends were secured to the extended forks of the Fork Lift Truck (FLT). As the FLT lifted the cargo to its maximum upper level, the sling became entangled with a twist lock situated at the rear end of the chassis. This caused the FLT to be pulled at an angle from the side, resulting in it toppling over. The FLT operator, who became the victim, attempted to jump to safety but became trapped under the fallen structure of the FLT. Unfortunately, he sustained severe neck and internal injuries and later passed away during treatment at the hospital.

Remedial measures:

- Mobile cranes should be used when dealing with cargo that requires net slings with extended hands.
- Strict and effective supervision is essential for handling such types of cargo.
- Qualified and dependable signallers should be present during the handling of such cargo.
- All areas of the dock and approaches where lifting appliances and transport equipment are utilized should be well-constructed, surfaced with durable material, and maintained to ensure safe cargo transport.
- Stability tests for Fork Lift Trucks (FLT) should be conducted periodically before they are put into use.
- Safety belts should be provided on the seats of FLT drivers.
- FLT drivers and truck drivers should undergo regular physical fitness assessments.
- Periodic Occupational Safety and Health (OSH) training should be provided to all dock workers, including drivers of all categories.

Central Labour Institute, Mumbai			
Sl. No.	**Title of the Programme**	**Period**	**Course Coordinator**
FEBRUARY 2024			
1	Testing of Lifting Appliances and Loose Gears for aspiring or approved Competent Persons	05 - 07 February 2024	Dock Safety Division Email: b.chakradhari@dgfasli.nic.in Phone: 9329218121
2	Training Programme on Hazard Identification and Risk Assessment (HIRA)	07 - 09 February 2024	Shri N B Reshamwar, AD(S) Email: nb.reshamwar@dgfasli.nic.in Phone:8240845416
3	Effective Utilization of Artificial Intelligence , Machine Learning and Drone Technology in OSH inspection	12 - 14 February 2024	Shri S Datta Choudhury, DD(S) Email: sdc@dgfasli.nic.in Phone: 7003008407
4	Preparedness for Chemical Disasters in Factories	14 - 16 February 2024	Dr. S.B. Mishra, Director (IH) E mail: cli-mahc@dgfasli.nic.in Phone : 9840325244
5	Training Programme on Occupational Lung Diseases & their prevention at Workplace	21 - 23 February 2024	Dr. S. Saini, Director (Medical) Email: ss@dgfasli.nic.in Phone: 022-24060571
6	Work Environment Monitoring at workplace	26 - 28 February 2024	Shri. P. G. Satpute, AD (IH) Email: p.satpute@dgfasli.nic.in Phone:7208693248
7	Training Programme on OSH Safety Audit	27 - 29 February 2024	Shri G.P. Vijaya Krishna, Director (ST/P) Email: gpv.krishna@dgfasli.nic.in Phone: 9849995415
MARCH 2024			
8	Training programme on Behavior Based Safety – A Proactive Approach for Occupational Safety and Health	11 -13 March 2024	Shri S.N.Borkar , Dy. Director (ST/P) E mail: snb@dgfasli.nic.in Phone : 9323433691
9	Measurement of Hazardous substances in industries	13 -15 March 2024	Dr. R.P. Bhave, Dy.Director(IH) Email: drrpb@dgfasli.nic.in Phone: 8879111331
10	Refresher Course on Occupational Diseases & their Prevention for Factory Medical Officers	18 -20 March 2024	Dr. D.Kolekar, Dy. Director (Medical) Email: devendra.kolekar@dgfasli.nic.in Phone: 022-24060588
11	Training Programme on Safety, Health and Environment for Safety Officers	20 - 22 March 2024	Shri N B Reshamwar, AD(S) Email: nb.reshamwar@dgfasli.nic.in Phone:8240845416
12	Management of Major Chemical Accidents in Factories	25 - 27 March 2024	Dr. S.B. Mishra, Director (IH) E mail: cli-mahc@dgfasli.nic.in Phone : 9840325244

Regional Labour Institute Chennai			
Sl.No	**Title of the Programme**	**Period**	**Course Coordinator**
FEBRUARY 2024			
13	Training Programme on “Safety Inspection at Workplaces”	5-7 February 2024	Safety Division Shri A.K. Das , Asst. Director (Safety) Email: akd@dgfasli.nic.in Phone: 7057795710
MARCH 2024			
14	Training Programme on “Accident Investigation and Reporting System”	10 - 13 March 2024	Safety Division Shri Nag Mani Mishra, Asst. Director (Safety) Email: nmm@dgfasli.nic.in Phone: 944509556
15	Training Programme on “Aspect of Industrial Hygiene and Work Environment Monitoring in Industries”	18 - 20 March 2024	Ind. Hygiene Division Dr.Nitin S.Gedam, Asst. Director (IH) Email: nitin.gedam@dgfasli.nic.in Phone: 8178726356

Regional Labour Institute, Faridabad			
Sl. No.	**Title of the Programme**	**Period**	**Course Coordinator**
FEBRUARY 2024			
16	Compliance under BoCW RE&CS Act for supervisors at construction sites	2nd February 2024	Shri. Saket Kumar Pandey, DD(S) Email: saketk.pandey@dgfasli.nic.in Phone: 9303837526
17	Training Workshop on HAZOP	8th February 2024	Dr. Kunal Sharma, Asstt. Director (S) Email: sharma.kunal@dgfasli.nic.in Phone: 9899056933
18	Training program for Safety Stewards	22ndFebruary 2024	Shri Sanjeev Kumar, AAD (Safety) Email: sanjeev.kumar@dgfasli.nic.in Phone: 9432144318
MARCH 2024			
19	Safety in hand and portable tools	1st March 2024	Shri Amit Gola, Asst. Director(S) Email: amit.gola@dgfasli.nic.in Phone: 7011162109
20	Safety, Health and Environment in Engineering Industries for supervisors	05 - 07 March 2024	Shri. D. Gnanasudaram, AAD (Safety) Email: dgn@dgfasli.nic.in Phone: 9445812159
21	Role and Responsibility of Safety Officer	20th March 2024	Shri. Karunesh Srivastava, AD (Safety) Email: kas@dgfasli.nic.in Phone: 9415190078

Regional Labour Institute, Kanpur			
Sl. No.	**Title of the Programme**	**Period**	**Course Coordinator**
FEBRUARY 2024			
22	Training Programme on Management of Work Environment Hazards	6 - 8 February 2024	Industrial Hygiene Division Smt. Dhanshree Acharekar, AD (IH) E-Mail: d.acharekar@dgfasli.nic.in Phone: 9082038657
23	Role of House Keeping to improve safety in industries	27 - 29 February 2023	Safety Division Shri. G. Sibananda, AD (Safety) E-Mail: gs@dgfasli.nic.in Phone: 8953897880
MARCH 2024			
24	Survey and Research Methodology in Occupational Health	06 - 08 March 2024	Industrial Medicine Division Dr. Arkaprabha Sau, DD (IM) E-Mail: arkasau@dgfasli.nic.in Phone: 8981568707
25	Effective Safety Management	12 - 14 March 2024	Safety Division Shri. M.B. Kasulla, AAD (Safety) E-Mail: sp@dgfasli.nic.in Phone: 8655775051

Regional Labour Institute, Kolkata			
Sl. No.	**Title of the Programme**	**Period**	**Course Coordinator**
FEBRUARY 2024			
26	Statutes on Safety, Health and Welfare at Workplace	12 - 14 February 2024	Shri. H.M. Bhandari, DD (Safety) Email: hmb@dgfasli.nic.in Phone: 8779187240
MARCH 2024			
27	Work environment parameters – Hazards & their Control measures	20 - 22 March 2024	Shri. Harikesh Meena, AAD (Safety) Email: harikesh.meena@dgfasli.nic.in Phone: 9123341506

Regional Labour Institute Shillong			
Sl. No.	**Title of the Programme**	**Period**	**Course Coordinator**
FEBRUARY 2024			
29	Training program on OSH for construction site with statutory Provisions	19 - 21 February 2024	Shri. Ashish Jambhe, Asst. Director (S) Email: avj@dgfasli.nic.in Phone: 9324243140

The above mentioned programmes are available subjected to inauguration and functioning of the institute.

LIST OF OFFICES OF INSPECTORATE DOCK SAFETY (IDS)

Sl. No.	Inspectorate Dock Safety office address	Office Tel. / Fax No. and email ID
1.	Chief Inspectorate Dock Safety, Mumbai N.S. Mankikar Marg, Sion, Mumbai - 400022	Office Tel.: 022-24060609 022-24074358 Email : docks@dgfasli.nic.in
2.	Inspectorate Dock Safety, Mumbai MbPT OSC Bldg., 3rd Floor, Opp GPO, P. D'Mello Road, Mumbai- 400038	Office Tel.: 022 – 22692180 66565511/58 Fax: 022-22613391 Email : idsmumbai@dgfasli.nic.in
3.	Inspectorate Dock Safety, Kandla Near Bunder Gate, Kandla Port, New Kandla, Post Box No.18,Dist Kutch, Pin – 370210, Gujarat.	Office Tel.: 02836 - 270249 Fax: 02836 - 270249 Email : idskandla@dgfasli.nic.in
4.	Inspectorate Dock Safety, Mormugao Civil Maintenance Office Building Mormugao Port Trust, Headland Sada, Mormugao, Goa- 403804.	Office Tel.: 0832-2520752 Fax: 0832 – 2520752 Email : idsmormugao@dgfasli.nic.in
5.	Inspectorate Dock Safety, Kolkata Nizam Palace, 1st floor, 2nd M.S.O. Bldg. 234/4 A.J.C. Bose Road, Kolkata-700020.	Office Tel.: 033-2830718/22830719 Fax: 033-22830718 Email : idskolkata@dgfasli.nic.in
6.	Inspectorate Dock Safety, Paradip Badapadia, Post Box NO.126 Paradip – 754142, Orissa.	Office Tel.: 06722-222413 Fax: 06722- 222413 Email : idsparadip@dgfasli.nic.in
7.	Inspectorate Dock Safety, Visakhapatnam Ex. D.L.B. Bldg., 5th Floor, Visakhapatnam Port Area, Visakhapatnam-530 035.	Office Tel.: 0891-2563857 Fax no. : 0891-2563857 Email : idsvizag@dgfasli.nic.in
8.	Inspectorate Dock Safety, Chennai 3rd Floor, Anchor Gate Bldg., Rajaji Salai, Chennai – 600 001.	Office Tel.: 044- 25220888, 25246419 Fax: 044-25220888 Email : idschennai@dgfasli.nic.in
9	Inspectorate Dock Safety, Tuticorin Tuticorin Port Trust, Admin. Office Bldg. Harbour Estate, Tuticorin – 628004.	Office Tel.:0461-2352372 Fax: 0461- 2352372 Email : idstuticorin@dgfasli.nic.in
10.	Inspectorate Dock Safety, Kochi C.D.L.B. Dispensary Bldg., G.V.Ayyar Road, Willington Island, Cochin – 682 003.	Office Tel.: 0484-2666532 Fax: 0484-2666532 Email : ids.cochin@dgfasli.nic.in
11.	Inspectorate Dock Safety, New Mangalore New Mangalore Port, Panambur, New Mangalore – 575010.	Office Tel.: 0824-2407781 Fax: 0824- 2407781 E-mail : idsmangalore@dgfasli.nic.in
12.	Inspectorate Dock Safety, Navi Mumbai Jawaharlal Nehru Port Authority, P.O.C. Canteen Bldg., Ground Floor, Sheva, Navi Mumbai – 400 707.	Office Tel.: 022-24060552 Fax: 022-22623391 Email : idsjnpt@dgfasli.nic.in

LOCATION MAP OF DGFASLI

INSTITUTES UNDER DIRECTORATE GENERAL FACTORY ADVICE SERVICE & LABOUR INSTITUTES (DGFASLI)

Central Labour Institute, Mumbai
N.S. Mankikar Marg, Sion, Mumbai - 400022
PBX No.91-22-24092275
Fax: 022-24071986
E-mail: cli@dgfasli.nic.in
Website: www.dgfasli.gov.in

Regional Labour Institute, TTTI P.O. Taramani Adyar, Chennai 600113,
Tel No.: 91- 44-22301407, 22350737,
FAX: 91-44-22352457
Email: rlichennai@dgfasli.nic.in

Regional Labour Institute Lake Town, Patipukur Kolkata 700089
Tel No.: 91-033-25342732, 25342735
Fax: 91-033-25348182
E-mail: rli.kolkata@dgfasli.nic.in

Regional Labour Institute, Sarvodaya Nagar, Kanpur 208005
Tel No.: 91-512-2218691/92
Fax : 0512-2215112
E-mail: rli_kanpur@dgfasli.nic.in

Regional Labour Institute,
Sector 47 Faridabad Haryana – 121003
Tel No.: 91-0129-2468000
Email: rlifaridabad@dgfasli.nic.in

Regional Labour Institute,
Rynjah, Shillong
Dist. East Khasi Hills, Meghalaya- 793006
Tel No.: 91- 9324243140
Email: rli-shillong@dgfasli.nic.in

Published by:

Directorate General Factory Advice Service & Labour Institutes
Government of India, Ministry of Labour & Employment
Sion, Mumbai – 400022, Maharashtra, INDIA